THE IRON TRADE REVIEW

VOLUME XXIII. CLEVELAND, O., OCTOBER 23, 1890. NUMBER 43.

THE IRON TRADE REVIEW.

A JOURNAL OF THE
IRON AND STEEL INDUSTRY, THE MACHINERY TRADE AND KINDRED INTERESTS
IS PUBLISHED EVERY THURSDAY BY THE
CLEVELAND PRINTING AND PUBLISHING CO.,
Corner St. Clair and Wood Streets, Cleveland, O.

TERMS, (strictly in advance):

One year	$3 00
Six months	1 50
Three months	75

Advertising Rates Furnished on Application.

ENTERED AT THE POSTOFFICE AT CLEVELAND, O., AS SECOND CLASS MATTER.

CLEVELAND, O., OCTOBER 23, 1890.

THE WEEK IN IRON CIRCLES.

General Features.

All industrial plants throughout the country are busy and rushed. Pipe works are melting iron heavily; stove manufacturers have large orders; special foundries are months behind in the fulfillment of contracts, and rolling mills are pushed with work, many running over time to keep pace with orders. As a consequence, some markets report a more liberal flow of orders for pig iron during the past few days. One of the strongest influences in favor of a firmer pig iron market is a decrease of 43,000 tons in the stock of iron at the furnaces during the month of September. Another factor, already in force, is the advance of 25 cents per ton in prices by the largest Southern company, based upon large sales which cover the capacity of its various stocks for several months to come. As the consumption of iron continues unprecedented, and large consumers, like rolling mills and pipe companies, report an unusual amount of work on hand and in sight, the indications are for a steady trade for the Fall and the beginning of next year, with prices tending toward a higher basis. The strength of the market is unusual, and when one considers the tightness of money, and now that the natural demand has caused a firmer feeling, notwithstanding the closeness of money, it is felt that there are no other serious obstacles to overcome and check, and there will continue a strong feeling for several months to come. The strength of the financial situation in almost every department has been shown to a gratifying extent by the events of the past few days. The market has been strengthened in many respects by the removal of the threatening uncertainty which has hung so long over Wall street, and has put a stop to the fears of panic and general liquidation which at one time prevailed. Active buying is reported in the Chicago market, Northern and Southern coke brands being largely in the lead. Lots of 500 to 1,000 tons have been freely booked and the result is that the sales of the week foot up a good sized tonnage. Silveries and soft irons have also moved in large blocks, one or two of the Ohio furnaces having come into the market and forced sales at from 50 cents to $1 per ton concession. There has been some movement of Tennessee charcoal irons, but, for the most part, both Southern and Lake Superior charcoals have been quiet. Indications, however, all point to considerable buying of the latter during the next sixty days. The conditions which ordinarily produce a strong and advancing market seem to be present in the Pittsburgh market, and yet pig iron does not advance, but is weak and neglected. Possibly a change for the better may be nearer at hand than many generally suppose it to be. At Detroit there is an increased demand for low grade Southern iron. Jackson County silveries are scarce at full figures. Lake Superior charcoal has shown but few transactions, the larger buyers having already placed all or nearly all of their orders, the delivery of which will generally be completed by December 1st, the close of navigation. Manufactured iron of nearly every description is in good demand at firm figures, and prompt deliveries hard to obtain. St. Louis again reports a fair aggregate of business during the week, and undiminished activity on the part of local consumers. Southern furnaces are now statistically in a stronger position than at any time during the year, and an early rise in prices would scarcely surprise any one. The fact that consumption seems to be a little in excess of production has, our Louisville correspondent writes, caused one or two Southern companies to advance their prices 25 cents, making grey forge on the basis of $10.75 at furnace. It is felt that this price can be maintained and that sales at $11 for grey forge will be made before long. At the present time the indications at Buffalo point toward an increased firmness in tone for the pig iron market. There is an entire absence of uniformity of prices, a great variety of quotations being given for different brands which are of the same general character.

Iron Ore.

The end of the shipping season is in sight and at least two vessel owners who preferred to send their craft wild all the season rather than tie them up with charters, have made arrangements to lay up their floating property as fast as it arrives in port, here or elsewhere. The reason given for this step is the extremely low rate offered for ore freights on the one hand, and the corresponding saving in fixed charges and the cancellation of marine insurance accruing from the cessation of business before November 1st. Those ore producers who hold their fleet charter are crowding down all the ore they can, and it will puzzle more than one to fill their engagements. One thing has transpired through all the business flurries of the past three months, and that is the well-grounded opinion that ore sales should be confined to their proper season. All the troubles that have befallen the trade this year may be directly traced to the hasty and immense sales made last Fall. To be sure, they were induced by the eagerness of the consumers, and the simultaneous demand for ore, coming, as it did, from every quarter, was responsible for the advance in the price. Indeed, the ore men might just as well have asked half a dollar more than they did, and got it, too. There was a strange uneasiness among the makers of pig iron, and they seem bound to buy up all the ore in sight. The result has been disappointing to both producers and consumers. It may be put down as a solid fact that the ore to be consumed in this market next year will not be sold until after the opening of navigation in 1891, unless, indeed, some furnaceman is anxious to try the lesson of this year over again. During the prosperous season of three years ago no ore was sold until well into June, and the chances are that a similar condition of affairs will prevail in 1891.

Pig Iron.

No improvement can be noted as to prices, and but little in the activity of the local market. Sales continue small in extent, and for short delivery only, since the furnace interests are no more willing to sell for long future delivery at the market rate than the consumers seem anxious to buy. If pig iron, which is sold to-day at or below cost, were to be offered two dollars a ton cheaper, some of the consumers would immediately foresee some great calamity ahead, and would decline to buy. The market is suffering from want of confidence in its stability, and such bears as speculate in pig iron are pounding the market for all there is in it. The consumption continues without abatement, and the stocks held by the Western Pig Iron Association hardly represent a two weeks' supply. Under the circumstances there is good ground for belief that the necessities of some large consumer will compel him to enter the market against his will, and as the sensitiveness of the trade will quickly reflect the influence of some such transaction, the furnacemen will not be slow to take advantage of the turn.

Merchant Iron.

If the market is quiet, it is so for the only reason that there is nothing left to sell, at least for delivery this year. For a month past the mills have been crowded with orders, and no advance in price seems able to stop the upward movement. The demand is as strong as ever, and the large dealers cannot get sufficiently ahead to fill their broken stocks. Bar iron sells at $1.85 out of store, black sheets are away out of sight, and every product in the steel line is largely in demand.

SUBSIDIES AND SHIPBUILDING.

This is what *The Iron Trade Review* said last week in the course of an editorial on the subject of American shipbuilding and the new tariff law:

Encouragement the shipbuilding industry of the United States certainly needs; but the encouragement afforde dby the new tariff law falls far short of accomplishing the result desired. The experience of every great maritime nation confirms the wisdom of Great Britain's liberal policy in this matter, and the United States will have to follow suit if it would regain its once proud position.

And this is what the Cleveland *Press* says in reply:

England encourages shipbuilding by a free trade policy that has made her the chief mart of the world. That policy makes business for ships, and coupled with maritime regulations of the most liberal sort, accounts for the ships. We suppose the *Review* has reference to subsidies when it speaks of England's "liberal policy." Will the *Review* state the annual amount paid by the English Government to shipowners and for what purpose it is paid?

Very gladly. From 1854 to 1860 England spent $36,000,000 in building up her steam merchant marine. During our war she cut off many of her subsidies and reduced others, because of the absence of competition, until in 1865 she paid less than at any time since 1849; but the following year she saw the danger of revival of competition from the United States, and at once began to increase the compensation to her steamers. The United States did nothing until 1870, when a small subsidy was granted the Pacific Mail Company by our Congress. Fearing that this policy would become general, England increased her subsidies until they reached over $6,000,000 a year and kept them at that figure until the United States in 1873 abandoned her policy, when England returned to her old system. In 1854 England had 300,000 tons of ocean shipping. Since that time she has spent $225,000,000 in the form of subsidies for the avowed purpose of extending her commerce, and now has over 7,000,000 tons. In 1888, England gave in mail pay to her ships $3,184,874. Besides this she gave in naval reserve subsidies, in 1888, to the amount of two or three hundred thousand dollars, and, in addition, paid a portion of the wages of the officers and crews of such vessels as are enrolled in the list of the royal naval reserve.

But Great Britain is not alone in the policy of granting subsidies for the building up of a merchant marine. Canada pays $730,000 per annum in the way of subsidies and compensation for mail carriage. During the past twenty years, France has paid $90,000,000 in subsidies to her shipping. In 1888 Germany paid $2,084,410 in subsidies, besides $1,047,200 for mails transported, or $3,134,610 in all. Spain pays in subsidies over $1,000,000 per annum; Brazil, about $2,000,000; and so on down.

During this period of subsidizing by foreign powers, the United States, without such encouragement, has fallen from second place among the maritime nations in 1860, when she carried 84 per cent. of her own commerce, to the pitiable fraction of only 14 per cent.! In the meantime we are paying $150,000,000 a year on our carrying trade, thus giving employment and profits to hundreds of thousands of foreigners, where our own people might be engaged.

"AN AMERICAN RAID ON BRITISH CAPITAL."

One of our esteemed English contemporaries has obtained possession of the great big and exclusive "fact" that "shrewd Americans are already arranging for a raid upon British capital," and it fully expects that, among other things, "money will be wanted to establish tinplate works in America." It is convinced "that the Protective Tariff will be followed by a reaction in favor of Tariff for revenue only, and that one of the first acts of the next Government in the States will be to undo the mischief which the McKinley Bill will have inflicted, not on British interests, but on American trade." After evolving this stupendous prophecy, it goes on to caution its readers "to regard with the greatest suspicion every manufacturing enterprise seeking its capital in this country (England)." It regrets to see it stated in some of the papers "that Americans are lavishing their hospitality on the members of the Iron and Steel Institute, with the ulterior object of securing their good offices in obtaining British capital for American enterprises." "This is an ungenerous insinuation," it adds, "but we fully anticipate that not a few of the travelers will return with plans and projects of a more or less feasible nature, to carry out which large sums of money will be needed."

It is our painful duty to confirm this suspicion on the part of our vigilant London contemporary. At the recent New York meeting, the Hon. Abram S. Hewitt was overheard to remark to Sir James Kitson, that he had a corner lot in one of the Southern boom towns which he would sell at a sacrifice, while at Pittsburgh, Mr. Andrew Carnegie, in a sudden burst of confidence after dinner, offered Sir John G. N. Alleyne to trade a few shares of stock in his big steel company for a castle on the Clyde. It is, moreover, currently reported that Mr. Jeremiah Head returns to England with his inside coat pocket on the point of bursting with a proposition from the Bungtown Plow Shop to sell out to an English syndicate on the basis of 5,000 cents on the dollar. Our London editor does well to caution his compatriots against a country where schemes of this sort grow on every bush.

CANADIAN BESSEMER ORE.

For some time past it has been claimed in certain Canadian circles that good Bessemer ores from that country could be laid down in Cleveland at $3.90 per ton. This assertion naturally called forth comment, especially on the part of the Free Trade press of the United States, and the question at once arose whether the statement was true. The answer of *The Iron Trade Review* was, that, whether true or not, it had never yet been demonstrated. Reverting to the subject, and our comments as above the *Canadian Manufacturer*, in its current issue, says:

We have frequently stated that a certain good Canadian Bessemer ore could be laid down in Cleveland for $3.90 per ton; and in our last issue we gave the result of six analyses of this ore, one made by Prof. E. C. Chapman, of Toronto, and others by well-known chemists and metallurgists connected with some of the most important steel works in the United States. These analyses showed the presence of from 64.26 to 69.99 per cent. of metallic iron, but faint traces of phosphorus, from 1.96 to 4.5 per cent. of silica, and but slight traces of sulphur. These analyses demonstrated that this ore was of a very superior quality, and well suited for the manufacture of Bessemer iron and steel. We also showed that this ore bed contained at least one million ton of such ore within one hundred feet of the surface.

So far so good. Concerning our statement that the only Canadian ores thus far laid down at Cleveland were too full ot sulphur for use in our blast furnaces, the *Manufacturer* says:

It is not claimed that all Canadian iron ores are free from sulphur, nor is it denied that there are ores in the vicinity of the bed alluded to that are thus contaminated. It is exceedingly unfortunate that some years ago some of these sulphurous ores were sent to Cleveland, wtih the result that Canadian ores generally are supposed to be of this undesirable character. There are numerous ore beds in Canada producing as desirable ores as any mined in the Lake Superior region; and Canada is now suffering from the attempts made by some unwise men several years ago to palm sulphurous ores upon prospective investors as strictly first-class Bessemer ores.

But regarding these sulphurous ores, it is clear that they are of great value, and that the cost of desulphurization of them is but a small matter. Dr. S. G. Valentine, of Lebanon, Pa., in a paper read by him before the American Institute of Mining Engineers, at their meeting last year at Ottawa, stated that over 1,500,000 tons of sulphurous iron ores were consumed annually in the United States; that this large consumption had led to a search for the best methods of desulphurization, in order to make this class of material more available for the manufacture of a good quality of pig iron, and that the desired result could be obtained by the use of the Davis-Colby roast kiln, at a cost not exceeding 25 cents per ton where fuel is cheap.

In conclusion our Toronto contemporary refers to a paper read by Mr. T. D. Ledyard, of that city, at a recent meeting of the American Institute of Mining Engineers, in which he protests against the habit which has prevailed in some quarters of characterizing all Canadian ores as titaniferous and claims that Ontario contains many ores perfectly free from titanium. We certainly trust that our next door neighbor may find plenty of good Bessemer ores, and we have no objections to their being laid down in Cleveland at $3.90 per ton—but it hasn't yet been done, and there seems to be no immediate likelihood that it will be done.

PROOF, PIG IRON AND PERVERSITY.

As against the voluminous testimony printed from time to time in *The Iron Trade Review*, going to show that the pig iron storage system in England has been attended with great evil to the iron trade, the *Tradesman*, of Chattanooga, offers to print English testimony on the other side of the question. We call upon it to print this testimony alongside the comments of nearly all the leading English iron journals and many of the most distinguished iron men of Great Britain in opposition to the system. We do not recall ever having seen either kind of testimony in the columns of our Chattanooga contemporary. Let it print what it has in hand in favor of the system, and also give its readers, for the first time, the benefit of the high testimony against it.

The *Tradesman* also has the temerity to assert that "not a line of proof has been produced to show that the American Iron Warrant Company is essentially, or even incidentally, a speculative concern." It is entirely correct as to its own columns—not a line adverse to the pig iron warrant company has ever been printed by the Chattanooga mouthpiece. But it has not been for want of material, nor can it

justly be claimed that its attention has not repeatedly been drawn to the evidence on this point. It has either forgotten all that has been printed on this subject or it willfully ignores it. We need only refer to the literature of the warrant company itself and to that of its chief ally, the New York Metal Exchange, in proof of what we assert. No doubt the *Tradesman* has been regularly in receipt of these documents, so that its position is all the more indefensible.

It is not the fault of the manipulators of storage warrants that they have not yet obtained a grip upon the iron markets of the country. The reason lies in the good sense of the iron men of old and substantial sections. They will have none of it.

GOVERNMENT STEEL TESTS.

The representatives of various steel plants, in conference with the Secretary of the Navy, last Thursday, were not altogether unanimous in claiming that the present Government steel tests are unreasonably severe, though the complaints from some quarters were plain and outspoken. For instance, the representative of the Union Iron Works, of San Francisco, asserted that the present policy of the Government had a tendency to discourage, rather than foster, a new industry. It was a shortsighted policy on the part of the Government to exact conditions which were destined to confine the work to a few establishments. He was prepared to show that the Department paid more for its material than private purchasers, who insisted only on reasonable merit. He asserted that the Government paid a double price for material, without securing a proportionate increase in quality. The Solid Steel Casting Company of Alliance, O., on the other hand, said that the specifications were not a source of annoyance to them. The delays were such as were liable to overtake any imperfectly equipped establishment. The remedy would come with the completed plant. The bulk of the testimony, however, was that the present requirements, though not felt so severely since the improvement in processes of steel casting, should be modified to some extent. It is to be hoped that the Steel Board will adopt a more liberal policy in the near future.

SCOTCH FURNACEMEN AND SUNDAY WORK.

A curious phase of the labor trouble in Scotland is the attitude of the blast furnacemen toward Sunday work. The men ask for the Sabbath as a day of rest, and, failing in this, they demand "time-and-a-half" payment for their services on that day. The London *Iron and Steel Trades Journal*, commenting on this, remarks that, "in their plea for 'Sabbath rest' the men ought to strike a popular chord in Scotland; but their willingness to work if the masters make it worth their while suggests that they are not urged by religious principle to stand out against Sunday work." There is no doubt that the position of the workmen would have been greatly strengthened had they left off the alternative proposition, since the love of a rest-day is deeply implanted in the heart of the average Scotchman. The proprietors of one concern, not connected with the others, and being free to act for themselves, have agreed to slacken the blast on Saturday nights and run out no iron on Sundays. If the associated masters carry their point, probably the striking men will return to Sunday work, though years ago the furnaces there were never tapped on Sunday, and casting on the seventh day of the week is in this instance a comparatively recent innovation.

An Electric Power Hammer.

Charles J. Van Depoele, who has been prominently identified with the development of electrical traction for street railway purposes, has devised an electric power hammer which represents a radically new application of electro-magnetic principles. In general design the hammer is quite similar to the steam hammer, with its vertical cylinder mounted upon an arched frame, and the rising and falling piston by which the hammer-head is carried. The novelty of the apparatus lies in the substitution of electro-magnetic power for steam by a slight and very simple modification of the mechanism. The piston is of magnetic material, and the cylinder is composed of a series of coils through each of which an electric current may be passed separately. The apparatus is virtually an immense electro-magnet, the cylinder being the coil and the piston answering to the core. The passage of an electric current through the coils forming the upper part of the cylinder raise the piston into the magnetic field thus created. By cutting off the current and simultaneously transferring it to the lower coils of the cylinder the piston is released and its descent is accelerated by the magnetic attraction created below. As a magnetic field can be created in any of the series of coils the blow may readily be shortened or lengthened as desired. The current is controlled by levers and connections identical with those used on an ordinary steam-hammer. The absence of the steam-pipe is the only feature distinguishing the machine from the common steam-hammer.—[Philadelphia Record.

IRON collars for horses subjected to exceptionally heavy work are fast coming into general use.

PROTECTION FOR BRITISH SHIPS.

Following is an interesting letter written by Mr. Wm. W. Bates to the *American Economist*, showing how the British commercial fleet is developed by protection given by the British Lloyds insurance institution: "The distinctive feature (of the British protection) is the partiality shown to iron and steel tonnage built or owned abroad. This feature is best seen in the table, where it is shown that nearly one-fifth of the tonnage registered at Lloyd's is disclassed. Nearly seven-tenths of the foreign wooden sail tonnage is disclassed, but of the British iron and steel sail tonnage less than one per cent. That is to say, the British metal tonnage is kept on class until it is lost at sea or broken up ashore, but foreign wooded tonnage either has no class given, or has its class taken away many years before it is worn out or unsafe. Following is the table showing the number and gross tonnage of United Kingdom, Colonial and foreign vessels classed and disclassed in Lloyd's Register for 1890-91:

Description of tonnage.	Classed tonnage.	Disclassed tonnage.	Percentage disclassed.
British steamers, steel	2.234,426	2 5,818	8.80
British steamers, iron	3,540,706	791.442	15 96
British sail, steel	275 768	100	0 03
British sail, iron	1,661,254	11,728	0.70
British sail, wood	233,925	312 738	57.20
Colonial steamers, steel	75,831	19,828	20.7
Colonial steamers, iron	67,158	59.643	47.00
Colonial sail, steel	.....	1,283	100.00
Colonial sail, iron	21,8?9	5,503	20.10
Colonial sail, wood	39,312	75,702	65 80
Foreign steamers, steel	546,242	48,195	8.15
Foreign steamers, iron	922,071	535,881	36 89
Foreign sail, steel	43,666	.....	.....
Foreign sail, iron	222,829	20.046	8.28
Foreign sail, wood	115,731	265,400	69.80
Totals	10,000,778	2,365,604	19.13
Grand total	12,366,382		

"The object of the favoritism shown by the table is not only manifest, but unmistakable. It is to influence the use of British built and owned metal tonnage, and to discourage the use of foreign-built and especially wooden tonnage owned abroad. By Lloyd's system all metal vessels are classed on the letter A, while wooden vessels are assigned to A and lower letters. And while wooden vessels have a rating in 'years' and lapse from grade to grade, metal vessels have no years and do not lose character in the Register with age and weakness. No system of inspection or classification could be more unfair; and all the other systems in the world are feeble in comparison with Lloyd's. The sea-going tonnage of the world is 22,151,651 tons, of which 12,366,382 tons, or 55.8 per cent., is registered in Lloyd's book. It may be estimated that the patrons of Lloyd's Register do seven-eights of all the ocean underwriting, hence the power of this British institution, by partiality to British shipping, to induce and protect its employment, which is done by differential rates on hulls and cargoes. These differential rates are often so severe as to condemn good foreign ships, American especially, to idleness and rot, while inferior British tonnage has constant employment. All at times the differential rates springing from the inspection policy of Lloyd's take the places of differential duties on tonnage and cargoes, in former times depended on to protect British shipping from foreign competition, but now abolished, done away in the interest of 'reciprocal liberty of commerce,' it is said. But the British Lloyd's system of protection has only been set up since free shipping was adopted. So it is clear that Great Britain has a protected marine, the same under free-trade as protection, flourishing by discrimination, and by not giving to foreigners their equal and just dues in the inspection, classification and insurance of hulls and cargoes."

Improved Tinplate Process.

Among the abstracts of British patent specifications as published is mentioned an improved tinplate process, gotten up by I. Bang and A. Ruffin, of Paris, France. It is usual to cover the bath of molten tin used to coat the plates by a layer of oil or tallow, for the purpose of preventing the oxidation of the tin both in the bath and on the plates when they are removed and are hot. The use of this oil has many serious disadvantges; it is a constant danger of fire, and has to be removed from the plate while it is still hot by an expensive scouring operation. If the grease is removed from the plate too early in the process the coating of tin assumes a blue and yellow tint, losing its brilliancy. A complete removal of the grease has to be effected generally by a final cleansing with turpentine. By the application of the invention to the process of tinning the oil is dispensed with. The tinning is conducted in a chamber deprived of free oxygen, but filled with a carbonaceous gas or air deprived of free oxygen by bringing it in contact with incandescent fuel. The chamber in which the process is conducted has a glass top to observe the operations, and has enclosed in it the tanks containing the hydrochloric acid and molten tin. The dipping is conducted by manual labor, leather sleeves being provided in the top of the chamber through which the men thrust their hands and manipulate the plates. An endless chain conducts the plates, after they are dipped, to a series of cooling chambers before they are exposed to the atmosphere.

A MAN of truly heroic make was Dr. Samuel Gridley Howe, whose life-story is told by his daughter, Mrs. Florence Howe Hall, in the November *Wide Awake*; the article takes its title, "A Modern Hero," from Whittier's noble poem of which Dr. Howe was the subject; the article is accompanied by a portrait of this great champion of the blind and of all distressed souls, painted in his young manhood by Miss Jane Stuart, the daughter of Gilbert Stuart, the artist. "Golden Margaret," by James Purdy, an episode of the Civil War, is the initial story of the number; further on appears a Southern dialect tale of great strength, "Lucy Pervear," by Margaret Sidney. A Western story, "How Tom Jumped a Mine," is from the pen of M. E. S. Stickney. *Wide Awake* is $2.40 a year. D. Lothrop Co., Publishers, Boston.

IRON AND STEEL MEN IN COUNCIL.

We continue herewith the *resume* of papers read before the British and American engineering societies:

PROGRESS OF GERMAN PRACTICE IN THE METALLURGY OF IRON AND STEEL SINCE 1876, WITH SPECIAL REFERENCE TO THE BASIC PROCESS.

BY DR. WEDDING.

[After an exhaustive review of the German iron industry, the speaker said:]

In conclusion I may be permitted to say that the outlook for our German iron and steel industry is neither all brightness nor all shadow. On the other hand, the patent law of 1877 and the tariff law of 1879 have greatly stimulated industrial activity a nd technical progress in this business, and the Thomas process, coming just at the right time, has made us independent of other countries for our raw material. On the other hand, the severity of military duty, both withdrawing and estranging from labor for three years every strong and healthy workman, and the compulsory contributions required by law from employers for the insurance (life and accident), medical care and pensioning of employes, constitute patriotic and philanthropic burdens, which we must needs feel in competition with other countries not similarly handicapped. But the iron masters of Germany make no complaint. On the contrary, purred rather than daunted by difficulties, they mean, by increased vigilance, energy, economy, technical skill and continuous scientific researches, to maintain the honorable rank of the German Empire among the iron and steel producing nations of the world.

THE DARBY PROCESS OF RECARBURIZATION.

BY A. THIELEN.

[The process was that invented by Mr. John Henry Darby, Managing Director of the Brymbo Steel Works, and in part was described as follows:]

Having attentively remarked an increase of carbon which took place in two pieces which had been treated in the coal fire for welding, he brought fluid steel into intimate contact with solid carbon, the result being a rapid absorption by the steel. Supported by this experiment, he founded on it his patented process by which fluid steel can be carburized by filtration through pieces of carbon, preferably in the form of graphite or wood charcoal, etc. This consists of a sheet iron cylinder, open at the top and closed at the bottom by a plate pierced with numerous holes, the whole being lined with refractory material. It is filled with the carbonaceous material and inserted either between two steel ladles or between the Siemens furnace and the steel ladle. The fluid steel takes its way through the interstices of the pieces of carbon, and is thereby brought, by apsorption of the carbon, to the wished-for percentage of carbon.

During the month of July, there was effected in the carburizing process another modification, which considerably improved one of our leading articles, viz.: tyres. We use for the manufacture of tyres small ingots containing sufficient material for one tyre, which, after being hammered into flat disks, are perforated in the middle, this perforation being enlarged before the disk is reheated before rolling. This method requires that the surface of the ingots is without any flaws, and it must be, as well, without any pores, as all deficiencies can be seen afterward in the finished type. The Siemens-Martin steel obtained by the carburization process does not show immediately after the casting an absolute even surface. The carburized material was therefore taken as material for tyres.

INTERNATIONAL STANDARDS FOR THE ANALYSIS OF IRON AND STEEL.

BY PROF. J. W. LANGLEY.

[This paper presented some of the results of the work of the American Committee, concluding as follows:]

The most important discovery made by the committee in this work pertains to the variable action of the double chloride solutions. This apparently throws doubts on the reliability of all carbon determinations previously made by this re-agent, since they show variations on the same steel lying between 1.016 and 1.150. When the degree of acidity is kept constant, the apparent quantity of carbon found is affected by the mode of preparation of the double chloride, by its age, and by the number of times it has been crystalized. A carbon sponge derived from a double chloride solution does not appear to lose any carbon by drying at a temperature under 100° C., but loses if the heat is higher. The problems now before the committee, as suggested by the above results, are: The determination of carbon in steel by some direct process not involving the use of double chloride; the direct combustion of finely divided metal in oxygen or chromic acid is one of these, or by fusion in a mixture of bi-sulphate and bi-chromate of potash. The determination, if possible, whether a neutral or alkaline double chloride liquid may not dissolve a portion of the carbonaceous residuum, and thus lead to results which are too low. The determination whether the addition of acid simply prevents this tendency, or whether the use of acid may not favor the separation of pre-existing organic matter in the liquid, and its retention by the carbon sponge, thus leading to results which are too high. The investigation of the cause of the influence of repeated crystallizations of the double chloride on the apparent quantity of carbon.

IRON ORES OF THE UNITED STATES.

BY PROF. I. STERRY HUNT.

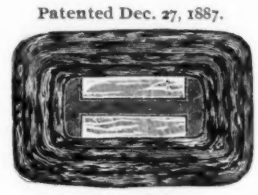
Up to the present time, it may be said that the iron industry of the United States is confined to the great region drained by the Mississippi and Ohio and their tributary rivers southward toward the Gulf, by the northern chain of lakes discharged by the St. Lawrence, and to the Atlantic mountain belt, whose drainage waters find their way by more direct channels to the Atlantic. The great physical features of this eastern half of the North American continent are remarkable. Between the eastern front of the Cordilleras in Colorado and the mountains of the Atlantic belt and the Appalachians, which stretch from New England and Eastern New York to Alabama, spreads the vast region traversed by navigable rivers, from Lake Superior southward to the Gulf of Mexico and eastward to the Gulf of St. Lawrence. In one place alone is the great Atlantic barrier broken. This is where the tidal and navigable waters of the Hudson river traverse the Highland, and, permitted by the sinking away of the Appalachians in Southern New York, connect the waters of the Hudson, through the Erie Canal, with those of Lake Erie, and through Lake Champlain with the St. Lawrence, affording a system of internal navigation which must always give to the City of New York a commercial supremacy on our Eastern shores.

The Taconian ore deposits from Lake Superior furnished in 1887 over 44 per cent., and with those from the Cornwall mine, and the brown hematites of the Appalachian valley, considerably over one-half of the total iron product of the United States.

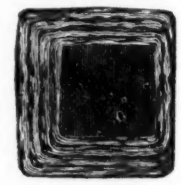
A NEW PACKING.

What the steam user and engineer wants in the way of packing is a soft, yet flexible, elastic, durable packing, which, by reason of its elasticity, will keep tight without friction. Long experiment has demonstrated that flax makes the best covering, for the reason that it holds the moisture, or condensation, better than any other fabric, thus making a better lubricator; and for this reason it is not nearly as liable to burn or char, or become hard or rigid under the action of either heat or water. Several good features are embodied in the "Sensible Automatic" packing, illustrated herewith, which is manufactured by the Sensible Automatic Packing Co., 63 South Canal street, Chicago, Ill. This packing is called "sensible" as it is made elliptical, so has

Patented Dec. 27, 1887.



BEFORE USING.



AFTER USING.

the correct principle; "automatic," for the reason that while it decreases in size one way, it expands in the other, under the action of heat, or, in other words, it does its work automatically. The core of this packing is made of pure (red and grey) Para rubber, covered with layers of the best soft long-fibre flax, which holds the moisture thoroughly. The lubricant is composed of Japanese wax, which is not affected by the action of either steam, water, ammonia, oils, alkalies or acids. This feature is essential to users of packings for any purpose. For these reasons the "Sensible Automatic" packing is said to be the very best for all steam or hydraulic purposes made. It is placed on the market in the usual sizes, ranging from one-quarter inch upwards.

Suez Canal Traffic.

During the year 1889, 3,425 vessels passed through the Suez Canal. The total freight carried amounted to 6,783,187 tons, showing an increase of 143,000 tons over 1888, and the number of passengers was 180,000, showing a falling off of 3,300. The gross traffic receipts were 66,313 302 francs, against 65,242,021 francs in 1888, and the net profits for the two years amounted to 37,212,821 and 36,271,247 francs, respectively. The number of ships passing through the canal at night by the aid of electric light steadily increases year by year. In 1887 there were 395; in 1888, 1,611, and in 1889, 2,445. During the early part of 1890 the number had already risen to 1,800. By traveling at night, as well as during the day, the average duration of the passage through the canal is 22½ hours. The shortest passage yet made consumed 14¾ hours.

Foreign Imitation of American Knives.

The importation of foreign goods stamped as if manufactured in the United States ought to have been stopped long ago. Under the guise of home production, the country has been flooded with worthless articles which no reputable manufacturer here would attempt to compete with. A very fruitful commodity under this head has been the pocket knife, bearing an American imprint of some nondescript company, but made of inferior materials in Germany or wherever the cost of labor is but a pittance. That our manufacturers engaged in this industry should have felt the injurious effects of such nefarious practices is not surprising, and we shall gladly hail the day when it will no longer be possible to perpetrate them.—[American Merchant.

Steel Rails on the Installment Plan.

The *Iron Age* reports the formation of a company for the purpose of supplying steel rails to industrial enterprises on the installment plan. It is proposed to supply the rails for a stated cash payment of 20 to 25 per cent. of the cost, and monthly payments during a period varying from two to five years. Until the purchase has been finally consumated, the title to them remains with the seller. Such a rail trust, if we may so term it, is likely to prove a very convenient matter to those embarking in industrial ventures without the means to purchase for cash, and without the facilities which bond issues afford to those who embark in the construction of chartered railroads.

A CAIRO telegram says the Government has decided to build a bridge across the Nile between Mansourah and Talkha, connecting the railway between Zagazig and Alexandria, thus shortening the distance. The estimated cost is £30,000. The work will be given out to contract.

AMONG THE IRON MINES.

Lake Superior Mining Notes:—

MARQUETTE RANGE.

Men and teams are grading an extension to the stock-piles of the Lake Superior hematite; this would indicate a larger output for next year than ever. A new trestle is also being erected from the western-most shaft, rising southeast to connect with the new stock-yards above mentioned. When the lake shaft reaches ore, there will be three unky shafts down upon the deposit, and the output will, of course, be correspondingly large. The basin of Lake Angeline will shortly produce such a prodigious amount of ore as to astonish even the world-renowned Norrie. There are now in process of sinking six shafts upon its classical shores. By next season these will have reached the mineral and the product will then be measured only by the demand. Extensive mining from these shafts cannot be conducted with safety, with the body of water now in the lake above the miners; therefore, it is a necessity that the lake should be drained of its contents, and preliminary steps toward this are already taken. When it is remembered that the hematite has been working for twenty years, most of the time full force, and yet not two thousand feet in length of the lenz mined out, one can estimate the years and labor required for mining out the whole basin. One can safely "bank" upon the future of the ore industry in this vicinity, and none need fear for the prosperity of the mining industry 'till long after the expiration of the twentieth century.—[Record, Ishpeming.

The Marquette *Mining Journal*, in speaking of the Schlesinger location at Negaunee, says: The surface workings, when the mines were first purchased by the present owners, were confined to the low valley extending north and south for a quarter of a mile, but have so encroached on the picturesque hills about as to entirely change the appearance of the place. There are now employed at the mines over 1,000 men, which force will continue at work all Winter. A large gang of mechanics are now engaged in building large trestles and ore platforms on which ore will be stocked during the Winter. In view of the limited space available for stock-piles, every ton of ore mined will continue to be shipped until navigation closes. The principal trouble that the company is experiencing is from the constant settling of the ground, though this does not interfere with the heavily timbered drifts below the surface. Just before the syndicate purchased the property last Summer, an immense cave-in occurred, which left an oval hole nearly an acre in extent, and since then all the ground about the place has been slowly settling. In two or three instances the switch tracks are so disturbed by this that trains have to move over them at a very slow rate of speed, although the work of leveling over and filling in the gaps is constantly going on.

The stock-piles at the Cleveland have been pretty well exhausted, excepting at the Cleveland hematite. Here the big steam shovel is now in operation, and there is considerable ore to be unloaded. The old Saw Mill shaft at the Cleveland will be robbed of its pillars next Winter. The dirt covering the ore will be milled from the surface into the mine, and the pillars attacked from the top, the open-cut system being adopted. There is considerable fine ore in these pillars that can be gotten at reasonable cost, and it will be obtained when the rush of the shipping season is over.—[Iron Ore.

MENOMINEE RANGE.

There is no question as to the future of the great Crystal Falls iron district. At present there are thirty properties being operated in the district, of which ten are shipping ore to market. Of the remaining twenty, spur tracks are being built to four properties; seven have well defined veins, four are on the line of railroad and the remainder are promising explorations, making it a safe prediction that the district will have at least twenty-five shippers before the season of 1891 is half over. Is there another iron ore district anywhere with such glowing prospects for future prosperity? The shipping properties are named as follows: Mastodon, South Mastodon, Dunn, Shafer, Youngstown, Monitor, Paint River, Great Western, Armenia and Mansfield. Following are the mines to which spur tracks are being supplied: Alpha, Hemlock River, Crystal Falls and Hollister. The properties located on the line of railroad are named: Night Hawk, Manganate, Lincoln and May. The properties which have developed enough ore to warrant a railroad, and which they can have when wanted, are: Monongahela, Atlas, Tobin, Lee Peck, Glidden, Mammoth and Junetta. The following are among the promising explorations going on in the district: Mastodon Mining Co., Wagner & Carey, Michigan Exploring Co., Charles S. Henry, Smith & Ray and Lustfield Exploring Co. There are several other explorations being carried on and more about to be started, which will help to make this the very busiest spot in the whole State of Michigan.—[Diamond Drill, Crystal Falls.

VERMILION AND MESABA RANGES.

There was great rejoicing on section 25, 63-12 a few days ago. The Great Northern Iron Co. has a lease of 400 acres in 25, 63-12, lying just east of the Eaton & Merritt and a few miles from the Chandler and other big properties. The company has been prospecting for a short time, cutting ditches across the vein and sinking test pits and a day or two ago uncovered what it was sure was the ore vein. It has uncovered 30 feet wide and a number of parallel ditches have shown it to be of great length, exactly how far it extends being as yet, however, a mystery. The ditches have been cut only six or seven feet deep and for a good part of that distance have been in ore, all the earth stripping required on the vein being apparently two or three feet. The vein matter is a true soft ore, similar to the Eaton-Merritt in all points, and therefore a Bessemer ore of the highest quality. It is a little softer than the Chandler. The company will push its developments more rapidly and will be ready for active business next Spring.—[Duluth Herald.

The Chandler Mining Co., says the Duluth *Herald*, has obtained control of the Pioneer mine, and as a consequence very active work in shaft sinking and developing is going on at this mine, and it looks even to a layman, as though it had a big future.' [It is predicted that it will prove as great a property as the Chandler. It has shipped nearly 10,000 tons this year, but next season will reach fully 100,000 tons.

A gentleman closely identified with the iron interests of the Vermilion range in conversation with a Duluth *Herald* reporter as to the season's output and the outlook said: "Last year the total output of iron ore for season from the Vermilion range was in the neighborhood of 837,000 gross tons and this year it will show an increase of 40,000 tons. There has been 25,000 more tons mined up to date than the corresponding period last year. If the favorable weather holds out 15,000 more tons at least will be shipped down from Tower and Ely. Shipments from Two Harbors' docks to date are 775,000 gross tons. The Chandler has shipped over 300,000 tons to to-day, equaling its total of last year, which was 306,000.

GOGEBIC RANGE.

Pick and Axe says it is reported on good authority that Frederic Weyerhauser and others have bought a controlling interest in the Geneva property, covering the southwest quarter of section 18, about two miles west of Bessemer. The Geneva was one time consolidated with the First National and went down with the Burton collapse. It is well located, and now that it has the necessary capital backing it, there are good hopes for its developing into a productive mine.

The men interested in the Geneva have added confidences each week in the ultimate importance of their property. An open pit only a few feet in depth just to the north of the high bluff and adjoining the county road, shows a good quantity of soft ore, similar to that found on the old Iron King when that property was first opened on the north vein. Provided the country road can be changed to run further north the company will do some shipping at the new find and they fully expect to develop a deposit or lens very near the surface.—[Florence Mining News.

The shaft at the Daylight has now reached a depth of about seventy feet. At the depth of about forty feet the footwall was struck and the shaft is now following the same. It will be put down about 100 feet and then a crosscut will be run north across the formation. The north side of the shaft is in ore of a good quality, and from all indications a crosscut to the north will show up a fine deposit of ore. Capt. Brynes is very sanguine concerning the future of the property, and certainly he has reason to be. Good surface improvements are being made.—[Iron Tribune.

To Develop Ontario's Mines:—

A committee appointed at a meeting of mineralogists held on Monday, at the Stock Exchange, Toronto, to report upon the advisability of forming an association for the purpose of aiding in the development of Canadian mineral resources met on Wednesday afternoon in the office of W. H. Lockhart Gordon. Prof. Goldwin Smith presided, and J. S. Lackie was Secretary. There were also present C. S. Morris, J. F. Lattimer, T. D. Ledyard, A. Harvie, Lockhart Gordon, and Prof. Smyth, Trinity College. The meeting was unanimously of the opinion that associated effort was necessary for the development of our mineral resources and for the dissemination of reliable information relative to the value of mineral properties which may be placed upon the market. A resolution to this effect was adopted. It was further decided to try and enlist the co operation of prospectors by requesting them to forward samples which might be placed on view at the rooms of the proposed association and examined by qualified analysts when necessary. C. S. Morris, A. B. Barry, Lockhart Gordon, T. D. Ledyard and Mr. Lackie were appointed to prepare a constitution and to report at a meeting of the committee to be held on the 14th inst.—[Hardware, Toronto.

Lake Superior Shipments of Iron Ore:—

Lake shipments of iron ore from the mines of Lake Superior, for the season of 1890, up to Wednesday, October 15th, are as shown by the appended statement, condensed from the Marquette *Mining Journal:*

MARQUETTE RANGE.

American	202	Hortense	9,124	Pitts. & L. Angeline	228,195
Barnum	6,758	Humboldt	19,079	Prince of Wales	24,518
Buffalo	71,405	Imperial	26,811	Prout	11,804
Cambria	60,623	Jackson	104,058	Queen	88,289
Champion	200,748	Lake Superior	250,050	Republic	153,206
Cleveland	212,265	Lillie	30,935	Republic Reduction Co.	3,955
Cliffs Shaft	143,661	Lucy	39,762	Salisbury	78,330
Detroit	4,058	Marquette Ore Co	2,243	South Buffalo	113,582
Dexter	4 548	Michigamme	50,257	Volunteer	115,677
East New York	26,712	Milwaukee	24,698	Winthrop	72,025
Fitch	10,937	Negaunee	63,708		
Grand Rapids	5,245	New York	2,423		
Total, Marquette Range					2,260,245

MENOMINEE RANGE.

Aragon	30 610	Hersell	345	Norway	57,884
Armenia	23,872	Iron River	128,934	Paint River	48,259
Chapin	563,631	Ludington	72,564	Perkins	8,239
Commonwealth	100,237	Mansfield	11,623	Pewabic	18,188
Cyclops	46,907	Manganese	1,016	Shafer	44,980
Dunn	118,377	Mastodon	57,374	Sheridan	595
Florence	173,178	Mastodon South	845	Vulcan	113,734
Great Western	62,691	Millie	27,211	Youngstown	35,366
Half and Half	616	Monitor	16,646	Walpole	2,248
Hamilton	17,582	Nanaimo	1,630		
Total, Menominee Range					1,775,382

GOGEBIC RANGE.

Anvil	27,524	Eureka	23,750	Odanah	1,066
Anvil No. 2	9,268	Father Hennepin	13,664	Pabst	97,965
Ashland	334,596	Federal	13,675	Palms	22 275
Aurora	183 331	First National	105	Ruby	8,913
Brotherton	52,706	Germania	32,073	Section 33	84,478
Cary	62,368	Iron Belt	90,527	Sunday Lake	1,393
Colby	171,764	Montreal	6,630	Superior	23,840
Comet	1,637	Mt. Hope	53,431	Trezona	38,439
Davis	564	Norrie	679,375	Windsor	23,525
Total, Gogebic Range					2,069,688

VERMILION RANGE.

Chandler	300,690	Minnesota Iron Co	469,177	Pioneer	9,162
Total, Vermilion Range					779,029
Grand Totals					6,884,344
To corresponding date of 1889					5,827,254

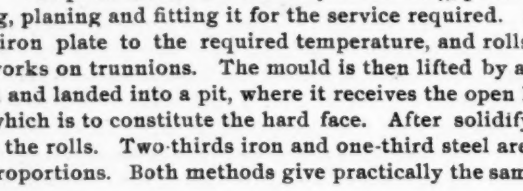
THE ANNAPOLIS ARMOR TRIAL.

The tests of armor begun at the naval ordnance proving grounds under the supervision of Commodore Folger, Chief of Ordnance, on the 18th of September, and continued and concluded on the 22d, were not only by far the most important ever held in this country, but were among the severest ever made anywhere in the long contest for supremacy between target and gun. The extent of the victory won by nickel-steel in this trial can be best shown by the illustrations herewith presented of the rival plates as they appeared at the end of the competition.

The plates tested were a compound plate, having a hard steel face and wrought-iron back, made by Charles Cammell & Co., of Sheffield; a forged steel plate made by Schneider & Co., of Le Creusot; finally, a plate also from Le Creusot, made from an alloy of steel with about 3¼ or 3½ per cent. of nickel.

Lieutenant W. H. Jaques, formerly of our navy, and now of the Bethlehem Iron Works, gives this description of the mode of manufacturing compound plates by Cammel and Brown:

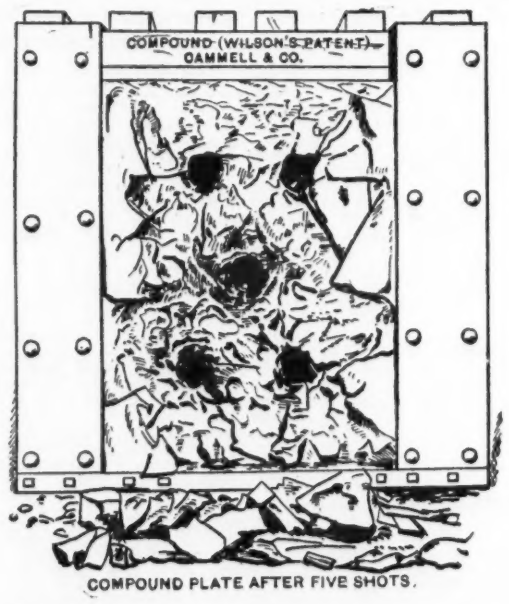
"The iron back is made by the ordinary method of manufacturing wrought iron plates, and is common to the two establishments. The method at present employed by Brown is to lay the forged steel face plate over the wrought iron plate, from which it is separated by a wedge frame round three sides and rows of steel blocks called distance pieces. Thus prepared, they are carried to the heating furnace, where, after covering all exposed steel surfaces with gannister, they are raised to the proper temperature and transferred to a vertical iron pit, where a hydraulic ram holds all the parts securely and prevents the bulging of the face plate. Molten steel, either Bessemer or open hearth, is then poured into the space between the plates,



THREE PLATES BEFORE FIRING.

and after sufficient time has been allowed for it to solidify, the whole is placed in a hydraulic press of 6,000 tons' capacity, and the thickness reduced about three inches. The plate is then finished by re-heating, passing through the rolls, bending, planing and fitting it for the service required. Cammell heats the wrought-iron plate to the required temperature, and rolls it into an iron mould that works on trunnions. The mould is then lifted by a crane to a vertical position and landed into a pit, where it receives the open hearth for Bessemer steel which is to constitute the hard face. After solidifying, the plate is finished in the rolls. Two-thirds iron and one-third steel are still accepted as the best proportions. Both methods give practically the same results under fire."

The most famous producers of steel armor are Schneider & Co., of Le Creusot, in France, while in England, Whitworth and others are well known. Lieut. Jaques says of Schneider & Co., that "besides possessing methods of composition, tempering, and annealing, and treatment generally, which no one has been able to equal, they have a valuable experience that enables them to rapidly increase the efficiency of their production." This last assertion has now been strikingly verified. In manufacturing compound plates one difficulty is that of joining the iron and steel, whereas a Schneider plate is a single ingot of homogeneous metal. These ingots, according to Rear-Admiral Simpson, of our navy, "are cast nearly cubical in form. An ingot of seventy-five tons is usually heated about eight times before being reduced to its final



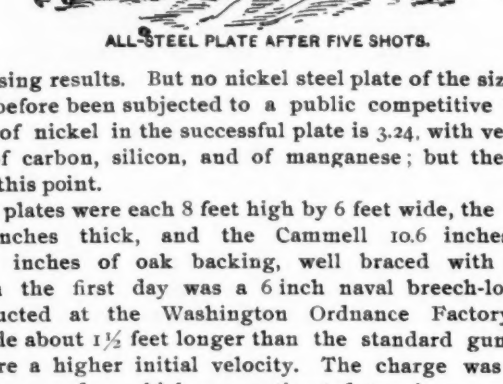
COMPOUND PLATE AFTER FIVE SHOTS.

shape, after which the edges are cut off with powerful tools." According to Lieut. Jaques, the difference of object in the two systems may be described as follows: "The steel face of compound armor contains about 0.7 per cent. of carbon, and its object is to deform or break up the projectile on impact, while the wrought iron back holds the plate together and keeps the steel up to its work; the iron back is not expected to be of much value in keeping out the shot after it has penetrated the steel face. Major McKinley, R. A., thinks that compound armor has an advantage because its face is so hard, but considers that the union of the two materials, steel and wrough iron, probably leads to complication and uncertainty in results.

"Schneider steel armor contains about 0.4 per cent. of carbon, and is very carefully tempered. The outer surface of the plate is slightly harder than the inner surface, and the object to be obtained is not only to destroy the shot on impact, but to present as great and nearly uniform a resistance as possible throughout the entire thickness of the plate, so that it may hold together till the shot is broken.

"Compound armor, therefore, shows a better advantage, so far as a surface work is concerned, when the projectiles are poor than when they are good."

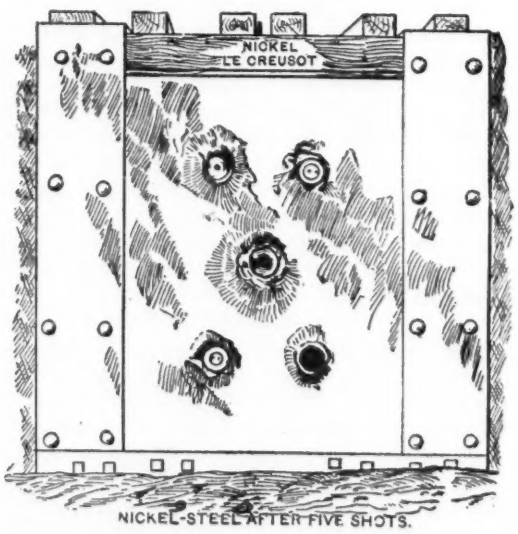
It only remains to speak of the third, the one containing an alloy of nickel. The possibility of obtaining greater tenacity from such an admixture has been a subject of study and experiment in Europe for two or three years. Schneider & Co. found that the tensile tests in certain combinations of nickel with steel were very satisfactory, and it is said that the ballistic tests with small plates



ALL-STEEL PLATE AFTER FIVE SHOTS.

yielded promising results. But no nickel steel plate of the size used at Annapolis had ever before been subjected to a public competitive trial. It is said that the alloy of nickel in the successful plate is 3.24, with very much smaller percentages of carbon, silicon, and of manganese; but there is no official statement on this point.

The three plates were each 8 feet high by 6 feet wide, the two Schneiders being 10.6 inches thick, and the Cammell 10.6 inches. They were bolted to 36 inches of oak backing, well braced with supports. The gun used on the first day was a 6 inch naval breech-loading rifle, specially constructed at the Washington Ordnance Factory for the purpose, and made about 1½ feet longer than the standard gun of this calibre, so as to secure a higher initial velocity. The charge was 44¼ pounds of American cocoa powder, which was estimated to give a muzzle velocity of of 2,075 feet per second, and a muzzle energy of about 3,300 foot tons. At a



NICKEL-STEEL AFTER FIVE SHOTS.

trial against a similar Cammell plate last Spring at Portsmouth, the initial velocity of the British 6-inch gun was but 1,976 feet, and the striking energy 2,800 foot tons. The projectiles used at Annapolis were Holtzer forged steel shells, made at Unleux, in France, 17 inches long and weighing 100 pounds each. The armor plates were ranged on the arc of a circle about thirty feet from the muzzle of the gun.

Twelve shots were fired. First came three aimed in succession at the lower right-hand corners of the three plates; then three at their lower left-hand corners; three more at the upper right-hand corners; while the final rounds were at the upper left-hand corners.

The first shot was at the Schneider all steel plate. The projectile perforated the metal, and its point reached a few inches beyond into the backing, turning up a little ridge of surface metal around the orifice, but leaving the rest of the plate intact.

The next shot was at the Cammell compound plate. It went clean through the plate and was imbedded in the oak backing, the point of the shell having penetrated more than two feet into the backing. The plate was splintered around the hole, and seven cracks were visible.

The third shot was at the Schneider nickel-steel plate. The projectile was

broken, and part of it flew back 25 feet. The point got through the plate and just entered the backing, as in the all-steel plate, and as in that also the only injury to the plate was immediately around the hole.

The second series of shots practically repeated and enforced the story of the first, and so it was with the third and fourth series. In each case the projectile was just about able to pierce the two Schneider plates, or perhaps to go a few inches into the backing, but in no case did either plate show cracks. In one instance the projectile rebounded from the all-steel plate and in another it was broken, while the nickel-steel plate broke two projectiles. But the Cammell plate suffered more and more from each shot. At the second shot the projectile broke, but the cracks previously showing as dark lines became open fissures, and many pieces of the steel face were torn off. The third shot set the backing on fire and showed a mass of deep cracks in the plate. The fourth shot dismantled the top of the plate, stripping off the steel face from the upper holes and going clear through the target, backing and all, the largest piece being sunk in the hillside.

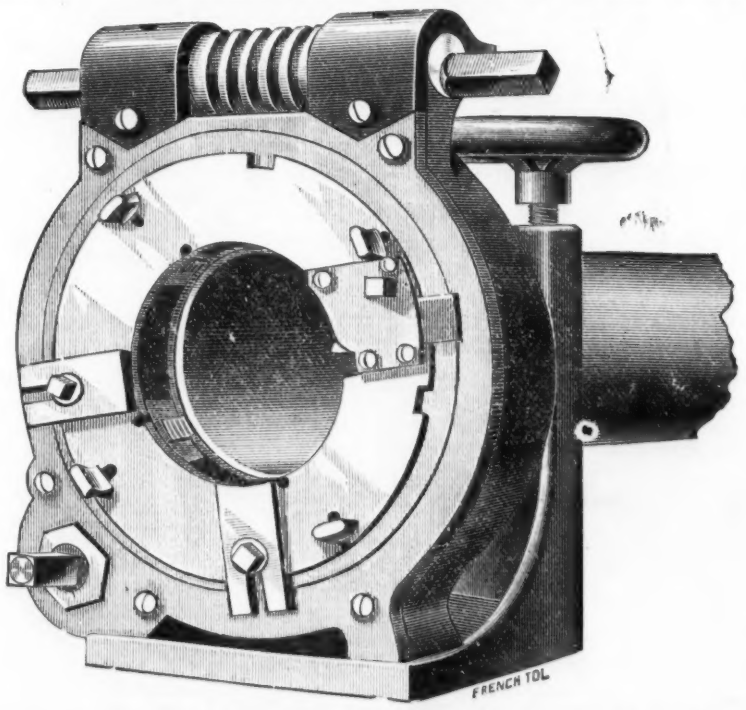
The first day's trial thus ended in the practical wreck of the compound plate and the triumph of the two steel plates, with the advantage rather in favor of the nickel-steel, as showing less injury, although it had allowed a little greater penetratiou of the projectiles. Four days later the trial was resumed with an 8-inch naval breach-loader, throwing a 210-pound shell, made by Firth, of Sheffield, on the Firminy process. Had a fifth shot been given instead by the 6-inch gun, it would have formed an ordinary test; as would have been only two shots with the 6-inch and one with the 8-inch gun. But the test was to be more exhaustive than had at first been intended. However, on account of the short range and the previous weakening of the plates, it was deemed prudent to use only 85 pounds of Duponts' brown prismatic powder in the 8-inch gun, which gave on initial velocity of but 1,850 feet.

The first shot was fired at the center of the all-steel plate. The point of the projectile penetrated it and entered 4½ inches into the wood backing, then rebounded, broken into three nearly equal parts. The edges of the hole were splintered, and four cracks radiated from it through the holes made by the 6-inch shots and continued to the corners of the plate.

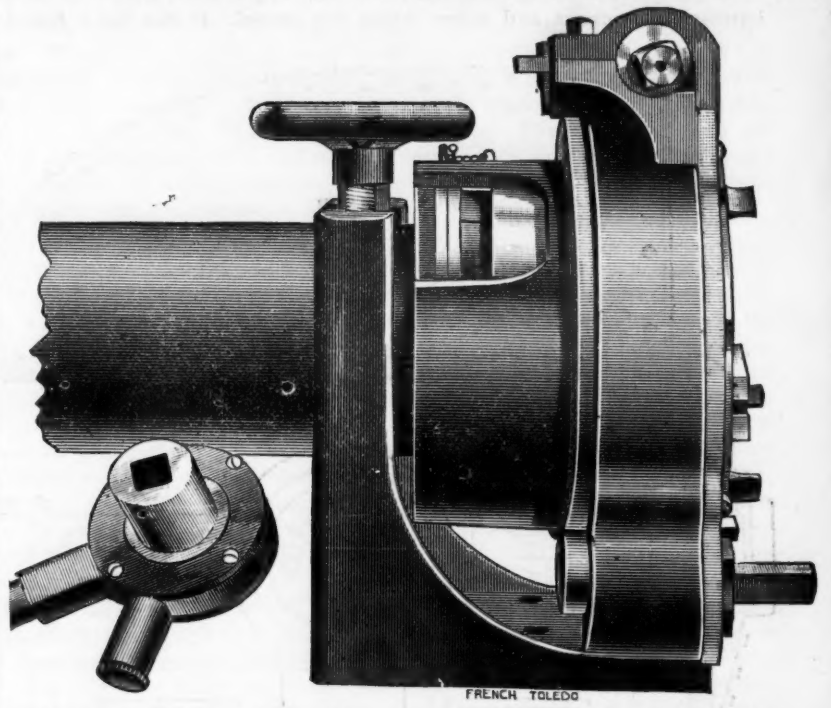
The second shot was fired at the center of the nickel-steel plate. The point of the projectile reached about 11 inches into the backing but was badly broken up, about a third of it remaining in the plate. What was most important, there were no cracks anywhere, and the only injury was the ragged edge around the orifice. The third shot was at the compound plate, and inasmuch as it had already been nearly ruined, the projectile went clean through the plate, through three feet of oak backing also, through a part of one of the braces, and lodged unbroken 12 feet deep in the packed earth. Almost the entire face of the plate was gone, to the depth of three to five inches, irregular lumps clinging to the side supports. The wrought iron back of the plate held its place against the oak, but it had of course offered little resistance. Fragments of steel flew long distances, and a mass of them dropped in front of the plate. Thus the trial ended in the victory of the nickel-steel. Save for the 8-inch shot, that victory would not have been so complete, since presumably the all-steel plate would have stood another 6-inch shot very well. The American guns appeared to great advantage, as did also the Holtzer projectile; but the Firth shells did less well. Congress showed its appreciation of the value of this trial by promptly authorizing the purchase of $1,000,000 worth of nickel ore and nickel matte, so as to permit the alloy of nickel in the steel plates to be made for our new ships. This can easily be done, since the Schneider process of making steel armor is the one used at the Bethlehem Iron Works in its large contract with the Government for our new navy.—[New York Sun.

PIPE-CUTTING AND THREADING MACHINE.

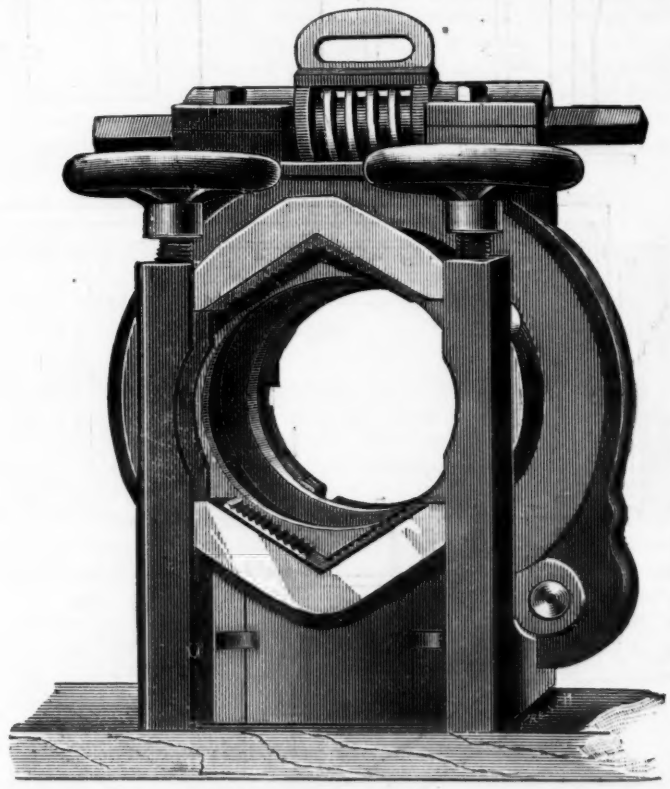
The Wells Machine Works, of Fostoria, O., are the manufacturers of a new six-inch-and-under portable pipe-cutting and threading machine. The differ-



ent engravings showing front, side, and rear of the same machine. The especial merits of this machine are, double application of power by means of worm and worm wheel, eccentrically journaled to the frame, which can be thrown out of gear at will, and adapted to be operated by either crank, ratchet wheel or belt, and a spiral ball pinion, which can be operated in the same manner, thus combining fast motion for light work, and slower, powerful motion for heavy work; a screw feed cutting-off knife, traveling annularly, true, always in place and convenient to operate; a positive, instantly changeable, double



leader screw, adapting the machine to any size pipe, above and including one inch, or with but slight additional cost to any lead of thread in use. The dies are sectional and interchangeable, and can be sharpened by grinding, they cut a full and accurate thread at one cut, thus making it possible for the machine



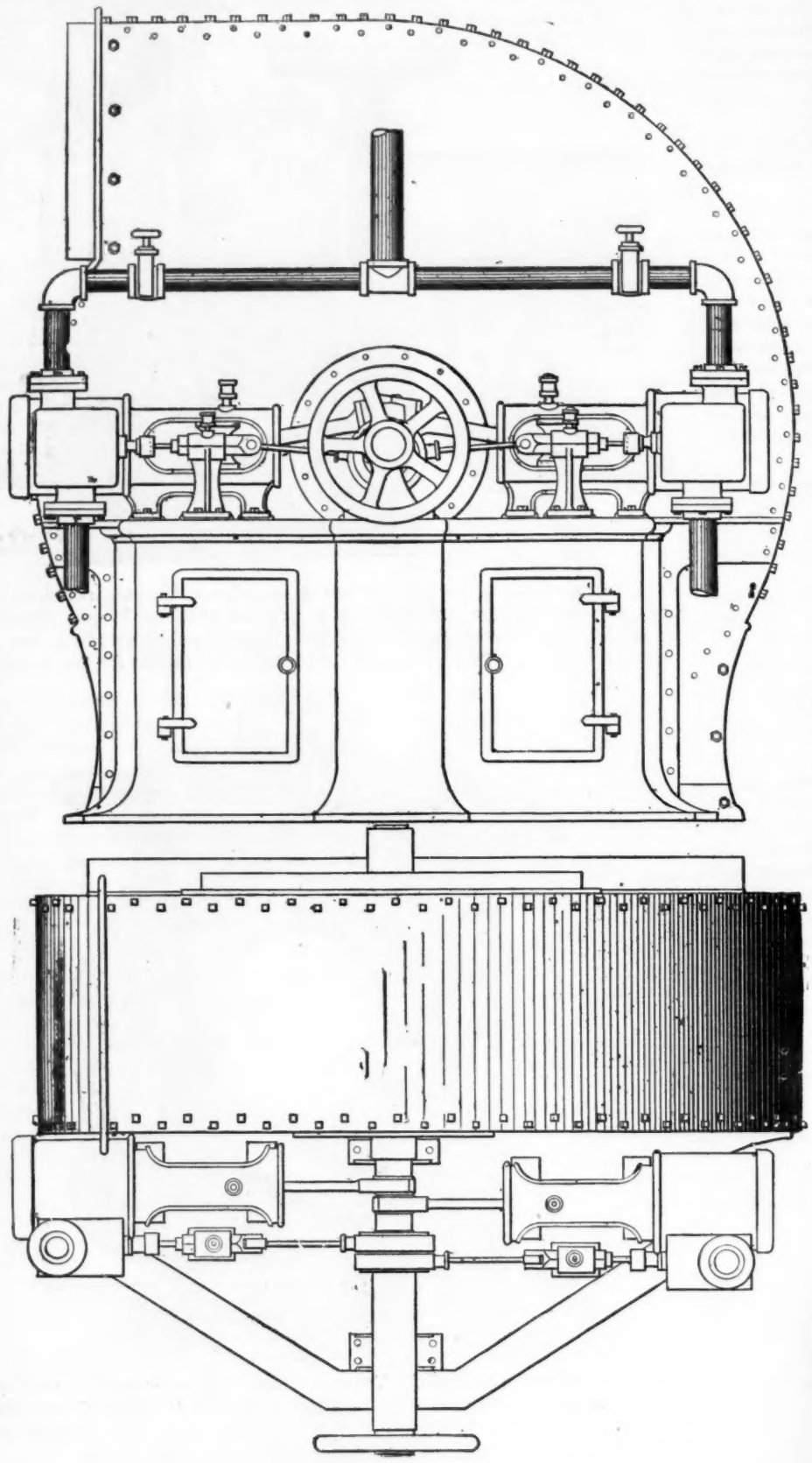
to be operated by the unskilled. These machines are self-contained and are operated with ease. They cover the whole range for pipe fitters' use, either for line men, pipe fitter's shop, or the average machine shop. For further particulars and prices apply to Wells' Machine Works, Fostoria, O.

Steel Stay Bolts.

Steel as a material for boiler stay bolts, is not meeting with unqualified success that has followed the introduction of the same metal for the plates of the boilers themselves, says the *Progressive Age*. More than one large railroad company has abandoned its use after an impartial trial, and returned to sligo, or some equally good brand of iron. The objection to the employment of steel is the great number of stays which break off, after a service of only a few months. In one boiler we examined recently, there were no less than 250 odd steel stay bolts broken, mostly in the throat sheet, and the front parts of the side sheets, after being in use nine months. The reason of this short life is undoubtedly the crystaline structure of steel, and the repeated bendings to which the stays are subjected, owing to the difference in expansion between the inner and the outer fire box sheets that they brace together. Several expedients have been tried with a view to obviating the destructive bending stresses, such as ball and socket joints for the stay bolt heads, etc., but nothing has yet been found to answer all the requirements. It is therefore safe to assume that as long as flat surfaces, stayed transversely by bolts, are employed in boiler work, just so long will there be trouble experienced with breakages —in other words, the evil is inherent.

BUFFALO MARINE FAN.

The Buffalo marine fan, illustrated herewith, was designed especially for the West India fruiting steamer "Neptune," and is located in the engine-room, arranged to exhaust the foul air from the ship's hold where thousands of bunches of bananas and other fruits are stored. It has been found that



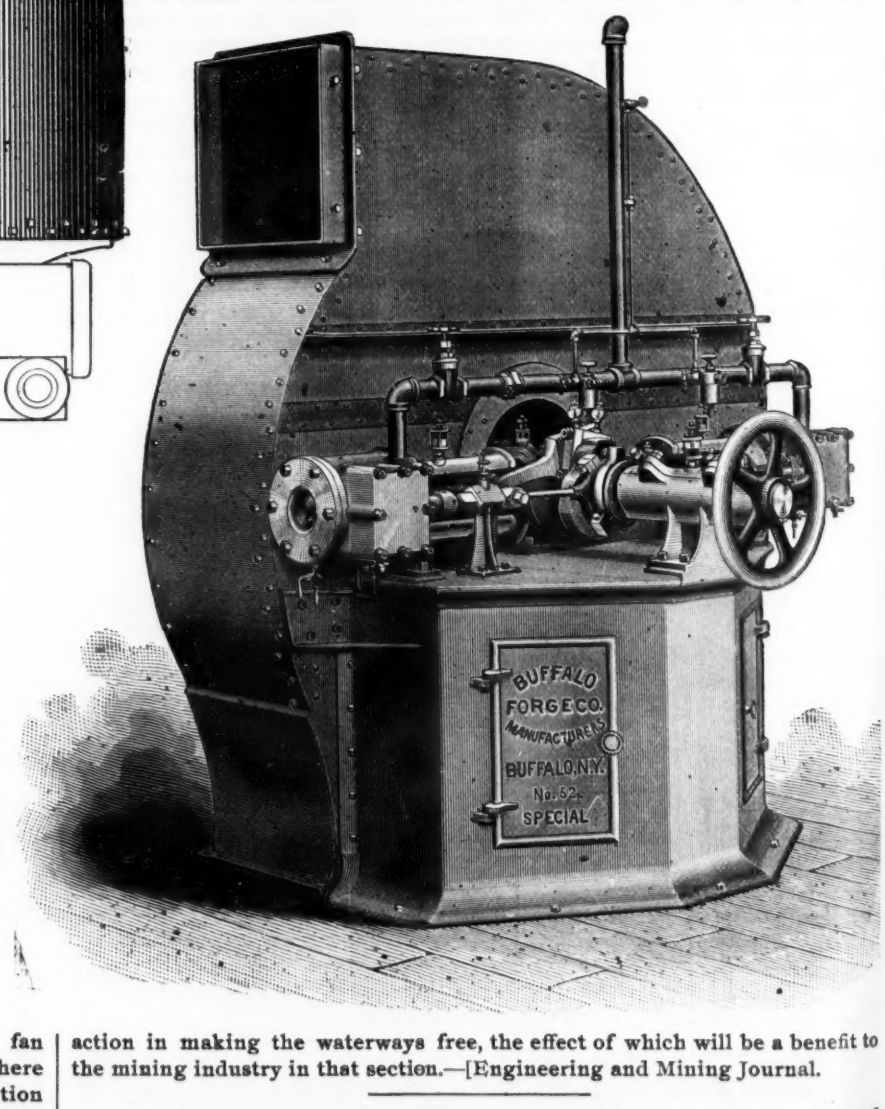
cargoes of fruit thus treated arrive in a wonderfully preserved condition, the loss from decay being very slight, and far less than with the ordinary manner of handling during transportation. Fans used for marine purposes are not uncommon, but it is seldom that they are properly constructed for the work. In the above instance, as in most cases of ship ventilation, it was desired to secure a certain amount of air at quite a pressure when running at a minimum speed, hence it was necessary to build out of regular proportions for ordinary work. Its peculiar construction results in obtaining 2½ oz. pressure at discharge and in keeping up a circulation of air in every corner of the ship. Aside from being utilized as a ventilator, the fan is arranged so as to serve a double purpose, that of a blower for the furnaces, the air being forced through the stoke hold to the fires. The fan replaces the air in the ship every minute and a half and is operated by a double direct connected horizontal engine of 12 horse-power. Each engine has ample capacity to drive fan independently. On account of the position these engines are used in, there being continual motion of the ship, the greatest care and watchful attention to every detail entering into their construction is employed. For further particulars address the makers, Buffalo Forge Co., Buffalo, N. Y.

The Factory as a Nomad.

A curious outgrowth of the rivalries of American cities, is the practice that obtains so generally of offering bonuses and pecuniary inducements to manufacturers to move their plant. After a fire that burnt down part of a sewing machine factory the other day, the owners received so many proposals from aspiring cities that wanted to take them in, that they were obliged to publish a notice to the effect that only a small part of their works had been burned and that they were not open to proposals for adoption. Any factory or established business employing labor, can have its choice, now-a-days, from a long list of cities, new and old, any one of which will give it a site for a factory, pay the expenses of moving, and perhaps contribute substantially toward the construction of a new building. People who own land, or are engaged in business in cities, realize that it pays them to have their cities grow, and they are willing to hire desirable inhabitants to come to them. They rely upon getting their money back in the increased value of land, or the general increase in business. The result is the migratory disposition, already so pronounced in these days, is intensified, and it has become a familiar thing, not merely for individuals to move, but for great aggregations of workingmen to shift the scene of their activities from one city to another, sometimes thousands of miles away.

Time was when, where the average man found himself living, there he continued to live, unless circumstances of exceptional urgency impelled him to change his residence. It is different now. Transportation has become so cheap, and travel so easy, that the ties of locality sit very lightly on the average American, and the fact you find him settled this year in New York or Pennsylvania, affords you a very uncertain basis for expecting to find him next year in the same place. When you hear of him again, if he hasn't moved to Texas, or Tacoma, or Southern California, or Maine, or North Dakota, you feel that he must have had some exceptionally good reasons for staying at home. Men used to wag their heads and croak about the inability of rolling stones to gather moss. We have changed all that. Moss is at a discount and there is a premium upon rolling.—[Scribner.

THE clause in the River and Harbor bill, passed by the Fifty-first Congress, appropriating $350,000 for the purchase of the Portage Lake & River Improvement Co.'s canal and the Lake Superior Ship Canal Railway & Iron Co.'s canal, has an important bearing on the copper mining interests of Michigan. These canals connecting Portage Lake with Lake Superior form a waterway across the Keneewa peninsula. They have always been owned by corporations which exacted tolls for their use. When we consider that by far the greater part of the traffic of the copper district, which in 1889 produced 86,000,000 pounds of copper, with its twelve or more mines and manufacturing industries, and 25 000 inhabitants, passed through these waters, we appreciate as just and wise the Government's



action in making the waterways free, the effect of which will be a benefit to the mining industry in that section.—[Engineering and Mining Journal.

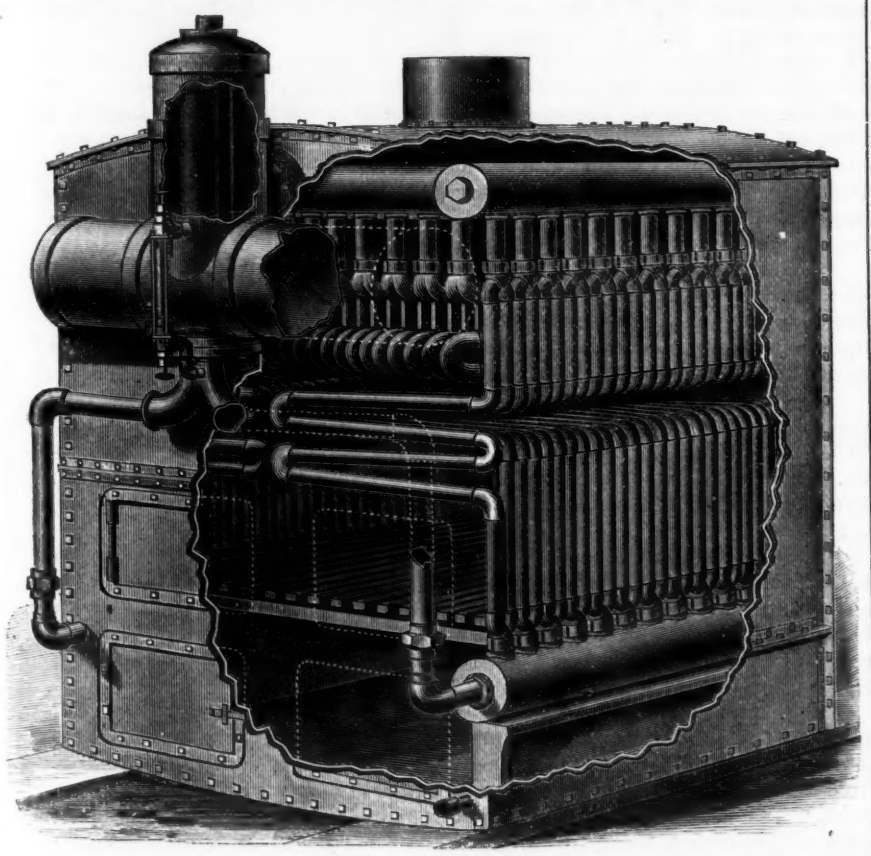
THE French mine inspector says that the sparks produced by the tools of miners striking against rocks are insufficient to ignite fire-damp.

THE ALMY WATER TUBE BOILER.

The cut of a new type of water tube boiler, Darwin Almy, of Providence, R. I., patentee, is an indication that many of the so-called objections to water tube boilers for marine use has been overcome.

Built by the Almy Water Tube Boiler Co., of Providence, R. I., it is made of either steel or wrought iron tubes, having fittings of malleable iron of the best quality, specially for their use from their patterns. The internal arrangement is of tubes vertical on three sides, then at sufficient height tubes horizontal. This forms the fire-box, the grate surface of which occupies 75 per cent. of floor space of boiler, and representing about one square foot grate area as equal to 25 to 30 square feet of heating surface of boiler. Other advantages are the great number of square feet within the fire-box, where all tubes exposed to radiant heat are of small diameter, and the direct vertical flow of the products of combustion are up, between and around the horizontal tubes, the under sides of which always present a clear surface to the heat, enables this boiler to be an extra quick steaming one. Steamships, torpedo boats, yachts, or merchant steamers provided with the Almy water tube boiler can have full head of steam from banked fire in 10 to 20 minutes.

The feed water is received at either front or back of boiler into lower manifold, passing first through a heater provided for that purpose, separate from but in connection with the boiler proper, from whence it enters boiler at a high temperature. The flow of water in circulation is continuous in one direction. Before completing the circuit the current of steam, containing water, enters the separator in front of the boiler, which takes the form of an involute coil. Here the dry steam rises to top of the separator where it is drawn off for engine power, and here, also, by the law of gravity, the water now freed from the lighter steam is returned to the circulation from the bot-



tom of separator to lower manifolds on each side of the fire-box. Repairs to this boiler are made under conditions of great convenience. A section of casing being unbolted, sections of boiler can be unscrewed, removed and replaced by any handy engineer or fireman. When necessary, any section can be blocked off at sea, with the same celerity that a tube in other boilers can be plugged. Tube sections are always obtainable at the works, or can be cut anywhere and replaced in fittings. The sectional form of this boiler, though usually rectangular, enables a lengthening or a widening of shape, as certain spaces may require. They are built in sizes from three square feet grate area to 50 square feet grate area, with height in the sizes from 15 to 50 square feet grate area, from 7½ feet to nine feet; while floor space for largest size of 50 square feet grate area requires but eight feet square. The weight of the Almy patent water tube and boiler, in the larger sizes, is about 400 pounds per square foot of grate area and from 250 to 350 pounds per square foot grate area in smaller sizes.

The Tiverton steamer, Queen City, has one of these boilers and the captain reports, comparing it with his former boiler: The marine return tubular boiler weighed 22,000 pounds, water 11,000 pounds, total 33,000 pounds, grate area 30 square feet, heating surface 1,000 square feet. The steam supply was frequently insufficient. The Almy water tube boiler weighs 12,000 pounds, water 2,000 pounds, total 14,000 pounds, grate area 30 square feet, heating surface 700 square feet. The steam supply is now always in excess of the needs and it is necessary to partly close the dampers a great part of each trip. The coal bill has been lessened 22 per cent. and the dead weight 60 per cent. We raise in 10 minutes 70 pounds of steam from a banked fire and gauge showing no pressure, and the boiler has shown no priming. A little boiler, with grate surface 33 inches square, developed 30 nominal horse-power when used experimentally by the Hotchkiss Ordnance Co. Besides the Queen City, steamers Planet, Firefly, Sierra Nevada, and Dispatch have been furnished with these boilers, also L. M. Kortright's yacht Eclipse and some smaller vessels in the Western waters, and the company is now building boilers for the Woonsocket Rubber Co., to operate fire pumps independent of the main boilers, and for steamer Granite City of Westerly.

These boilers are designed for 250 pounds per square inch steam pressure. Have been approved by the Board of Supervising Inspectors of the United States. There are numbers of them in use to-day in passenger steamers and steam yachts, resulting in economy in weight, space and fuel. These boilers are enclosed in sheet steel or iron casing, lined, where necessary, with fire brick and asbestos and throughout with asbestos. They are tested to 400 pounds hydrostatic pressure, and with all furnishings, are delivered complete ready to place and unite to engine. The Almy Water Tube Boiler Co. are at 47 Clifford street, Providence, R. I., and solicit correspondence.

English Capital in American Industries.

It is announced that the sale of the Roach shipyards to an English syndicate, which has been talked of for some time, has been consummated, the company which made the purchase having been organized, and nearly all the stock owned, in England. Thus another well-known institution passes into English hands, and we cannot help wondering where this movement is to stop, and how many of our "American industries" will be English industries before it does stop. It would seem as though it would be a good thing if less American capital were invested in Western farm mortgages, and more in manufacturing establishments. Of course, nobody expects the movement of capital to be controlled by what may be considered best for countries or communities. It will be invested where the best returns are to be had, security and convenience considered. But it is a question if American capitalists have not neglected opportunities for good investments in industrial enterprises, which have been taken advantage of by others. This is due in great measure probably to laws which required various trust institutions, savings banks, insurance companies, etc., to invest their funds in real estate mortgages, municipal, State, or government bonds. As we have before stated, we do not believe that the investment of English or any other foreign capital in American industrial establishments is a good thing for this country; for we do not see how it can be a good thing to have matters so arranged that our exports of things produced by American labor shall be paid for by dividends or profits made by other American labor, assisted by American enterprise and business management. If foreign investments here were sufficient so that the profits on them would pay for all our surplus of farm product exported, we do not see how America could accumulate wealth very fast. It seems to us we should simply be working for our board and clothes, so to speak, while the surplus produced would go abroad and we would get no return for it. We shall hope that American investors may be brought to preceive that it would be a good thing all round were they to see to it that well-managed manufacturing concerns here are supplied with all the capital required for the full development of their business, and if it were supplied in such a way as it is being supplied by the Englishmen, instead of simply loaned at a high rate of interest, which must be paid regardless of profits on the business, such investments would be found to give every reasonable security.—[American Machinist.

Sample Item from the Newspapers of Fifty Years Hence.

Considerable anxiety prevails over the non-arrival of the steamship "Electric Impulse" which left Liverpool for this port 47 hours ago. She is now 19 minutes over due. Her owners say, however, she is a slow boat; and it may be possible that she was detained at Cable Station No. 10, in mid-ocean, where the African mails for America are transferred from the boats enroute to Greenland. She was last reported from Ocean Station No. 6. Her electric motors, of which she has 20, are of 10,000 horse-power each, and are of old pattern. This boat, as slow as she is, is a wonder compared with the slow craft that ploughed the ocean 50 years ago, when steam was the motive power. The only part electricity played on steamers in those days was to light the boat, and the lamps gave a very feeble light as compared with the present system.—[Electric Age.

The Niagara Falls Tunnel.

Work has actually been commenced upon the Niagara Falls power tunnel, the first sod being turned by Mr. C. G. Gaskill, president of the power tunnel, with a silver shovel. Viewed from a sentimental standpoint, it would seem a pity that old Niagara should be put in harness and made to work in a prosaic sort of way, but all men are not of a sentimental nature, and the tunnel is simply a practical manifestation of the idea expressed by the enterprising and practical Yankee who, on viewing the Falls for the first time, remarked: "What a shameful waste of power." If the enterprise is a success, this power will not be much longer wasted.—[Railway Review.

THE complete novel in the November number of *Lippincott's Magazine* is contributed by Mrs. Jeanie Gwynne Bettany, the clever author of "The House of Rimmon." The story is entitled "A Laggard in Love," and the scene is laid in England, principally in what is known as the "Black Country." The homes and characters of the rustic people dwelling therein are described with a wonderfully graphic pen. Junius Henri Browne contributes a clever and appreciative article upon Balzac's women, entitled "Heroines of the Human Comedy." A sketch of Balzac, who is altogether too little known in this country, and a description of his peculiar methods of work, is weaved into this very entertaining paper. J. P. Lippincott & Co., publishers, Philadelphia, Pa.

EVERY time a cow moves her tail to swith a fly she exerts a force of three pounds. In the course of the Summer a single cow wastes 5,000,000 pounds of energy. The cows of America throw away power enough to move every piece of machinery in the world.

INDUSTRIAL SUMMARY.

New Enterprises:—

W. H. Withgott is erecting a new iron and brass foundry at Easton, Md.

Lill & Hillsley, of Philadelphia, Pa., will, it is stated, erect a nail factory in Kensington, Ga.

The Tiffany Iron Works, at Tecumseh, Mich., has been incorporated, with a capital of $50,000.

G. E. Wheeler and J. C. Keifer, Wilmington, Del., contemplate erecting a factory at Peidmont, Ala., for manufacturing a patent covering for steam pipes and boilers.

The Edward Best Car Axle Box & Lubricator Co., of Ottawa, has been incorporated, with a capital stock of $25,000, and will manufacture car axle boxes and lubricators.

The Folding Sewing Machine Co. has been incorporated, at Springfield, Ill., with a capital stock of $50,000. The incorporators are Marion O. Smith, Frank S. Smith, A. C. Smith.

The L. P. Trottier Axe & Edge Tool Manufacturing Co., of Three Rivers, Que., has been incorporated, with a capital stock of $40,000, to manufacture axes, hammers and other tools.

The Supply Manufacturing Co., of Pittsburgh, has been chartered, with a capital of $50,000. The directors are Wm. J. Hammond, Robt. A. Hammond, James H. Hammond and Wm. E. Justin.

The National Railway & Street Rolling Stock Co., of Boston, Mass., will, it is stated, build car shops, provided the citizens of Galveston, Tex., subscribe for $100,000 of the stock in a $500,000 company.

The Cardiff Rolling Mill Co. is the name of a $200,000 stock company organized by M. M. Duncan, H. C. Young, C. P. Moore and others, to manufacture sheet iron and sheet steel at Cardiff, Tenn.

A company is being organized at McKeesport, Pa., to engage in the manufacture of iron safes. James Evans, W. C. Soles, T. D. Gardner and W. S. Chandon, of that city, are interested in the project.

The Terre Haute Shovel & Tool Co., capital stock $100,000, have been organized at Terre Haute, Ind. The object of the company is to manufacture and sell all varieties of agricultural and horticultural implements and tools.

An organization has been formed at Cincinnati, O., to build pipe works at Radford, Va., under the name of the Standard Pipe & Foundry Co. The amount of paid in capital is placed at $300,000, and the work of construction will begin at once.

The Woodward Automatic Sight Feed Lubricating Co., of Chicago, has been incorporated to manufacture Woodward sight feed lubricators and other lubricating devices; capital, $100,000; incorporators, William Woodward, Walter A. Heath, C. T. Rausmusen and others.

The Toronto Rolling Mill & Forging Co., of Toronto, has been incorporated, with a capital stock of $200,000, and will erect works at West Toronto Junction. It will take over the plant and business of the Toronto Drop Forge Co., whose works have heretofore been in Toronto.

The Harvey L. Hopkins Co., Chicago, is the name of a new concern which has been incorporated to manufacture automatic box adjusters and other tools, machinery and appliances, with a capital of $300,000. The incorporators are Charles H. Himrod, Kirk Himrod, Charles L. Hopkins.

The Brosius Motor Sewing Machine Co., which was recently organized in Toronto, Can., with a capital stock of $300,000, have bought out the Wanzer Sewing Machine Co., of Hamilton, Ont., and will erect factory buildings at West Toronto Junction, to which they will transfer the Wanzer plant.

Cartwright, McCurdy & Co., proprietors of the Enterprise Iron Works, at Youngstown, O., have plans drawn for a puddle mill adjacent to their present plant. It will cost about $50,000, and will consist of a three-high muck mill and twenty puddling furnaces. It will give employment to about 100 men.

Enlargements, Additions, Removals, Etc.:—

H. J. Mitchell, of Lehighton, Pa., will move his car-spring works to Anniston, Ala.

The Ironton Stove Co., of Ironton, O., is to remove its stove works to Wytheville.

The Batesville Iron Works, Batesville, Ala., will add a foundry to its machine shops.

The Mt. Joy Novelty Iron Works, of Mt. Joy, Pa., will, it is stated, move its works to Frederick, Md.

The Louisville (Ky.) Pipe Bending Co. will enlarge its works and put in heavier punch and shears, also rolls for boiler work.

The Herzog Manufacturing Co., of Minneapolis, Minn., will erect a two-story brick forge and machine shop, and a one-story foundry, at a total cost of $45,000.

The Minneapolis (Minn.) Threshing Machine Co. will begin the manufacture of steam engines as soon as the necessary addition to their works can be built. The new plant will cost about $30,000, and give employment to some 125 men.

Isabella furnace (charcoal) of Joseph D. Potts, located at Barneston, Pa., which was burned down in January last, has been rebuilt of solid stone, with iron girders and iron roof, making it thoroughly fire proof. It will be put in blast in the early part of November.

The Enterprise Elevator & Manufacturing Co., Cincinnati, O., are increasing their contracts for elevators each week. They have just made a contract for one of the largest elevators in that city to hoist an omnibus and two horses. The two young men connected with the firm have the necessary push to make the business a success.

The capacity of the rolling mill of the Portage Iron Co., Limited, at Duncansville, Pa., has been enlarged by the addition of 17 more puddling furnaces and another train of rolls. The works now contain 37 single puddling furnaces, 6 heating furnaces and 6 trains of rolls. The nail-plate train has been taken out and a 20-inch muck train and a 7-inch hoop train put in. The additions to the equipment of the mill increase its capacity from 8,000 to 21,000 net tons of finished iron and steel annually.

Furnaces and Works Starting Up:—

Rebecca Furnace, of the Kittanning Iron Co., Limited, of Kittanning, Pa., which has been undergoing repairs for some time, has again been put in blast.

After an idleness of nearly three years, the Continental Tube Works, of Pittsburgh, Pa., are about to resume under new management. A party of Eastern capitalists, headed by T. B. Everson, of Pittsburgh, a former stockholder and manager of the old company, will operate the plant.

General Industrial Notes:—

The plans for a bridge across Saginaw river, at West Bay City, Mich., are now being drawn. The estimated cost of the bridge is $41,000.

On one turn, last week, the rod mill of the New Castle Steel Co., at New Castle, Pa., turned out 210,318 pounds of finished wire, which is the largest amount made by one turn in the history of the plant.

Savages have no use for machinery, but oftentimes civilized ones do. The Egan Co., of Cincinnati, O., are shipping some woodworking machinery to Levuka, Fiji Islands, Pacific Ocean. Their foreign trade is quite heavy now.

The United States Electric Light Co., of Cincinnati, O., have put in the Riverside Iron Works, Wheeling, W. Va., 80 arc lights and 100 incandescent lights; also for the Van Dorn Iron Works, of Cleveland, 300 incandescent lights.

Notice is hereby given that the co-partnership heretofore existing under the firm name of C. H. Presley & Co., Cleveland, O., has been dissolved by mutual consent, Mr. H. F. Parmenter retiring. All the liabilities of the firm are assumed by Mr. C. H. Presley.

One of the blast furnaces of the Isabella Furnace Co., at Etna, Pa., was put in blast on May 26, 1886, and since that date has produced 270,000 gross tons of mill and foundry iron. The other stack of the firm was blown in on August 1, 1888, and has made 175,600 gross tons of Bessemer iron.

Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until 2 o'clock P. M., on the 3rd day of November, 1890, for all the labor and materials required for the plumbing and gas-piping for the United States Post Office building at Dayton, O.

Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until 2 o'clock P. M., on the 15th day of October, 1890, for all the labor and material and fixing in place complete the low-pressure steam-heating and ventilating apparatus for the United States Court House and Post Office, building at Charlotte, N. C.

The Francis Fritsch Manufacturing Co., office 289 McMicken avenue, Cincinnati, O., have completed and put in iron work for a new brew house for W. Schlee, Columbus, O; iron work and millwright work for Texas brewing Co., Dalas, Tex.; machinery for L. Hoster Brewing Co., Columbus, O.; malt house, engine and boiler for Depinal & Reime Kamp, furniture manufacturers, Cincinnati, O.

The Westinghouse Electric Light Co. have made contracts to put in motor and other machinery for incandescent lights for Alex A. Arthur, general manager of the Middlesborough (Ky.) Town Co., in a very fine house he is building at Cumberland Gap, near the town of Middlesborough, Ky. It is very seldom that any companies have contracts to put in a plant for incandescent lights in private houses.

W. J. Burton & Co., Detroit, Mich., manufacturers of the "Eastlake" metallic shingle for roofing and siding, also conductors, gutters and all kinds of roofing sundries are having a steady and satisfactory influx of business. The demand for the roofing seems to be general. Their orders are coming in briskly from different portions of the country and city trade is keeping pace with its past record, being steady and active, their recent shipments embracing Ohio, Indiana, Illinois, Missouri, Kentucky, Georgia, Texas, Washington and numerous points in Michigan.

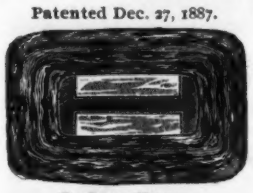
The Mill & Mine Electric Equipment Co., of Pittsburgh, Pa., have just completed the equipment of the Summer Hill mines at Woodville, Pa., with an complete electric plant of electric mining machinery. The power plant consists of one 9x10 Junior Westinghouse engine, one 30 h. p. 3-wire, 4-pole Westinghouse alternating generator; six "Hercules" coal mining machines; a twelve foot Pollock fan, with a capacity of 30,000 cubic feet per minute; centrifugal pump, etc.; the mining machines and pump being run by 3 h. p. Telsa motor. This is the second mine that this firm has fitted up in a similar manner this season, the first being the Monongahela Gas Co.'s mines at Wheelock Station, Pa. A careful record of the work of the mining machines in this mine from July 1st to August 8th showed that each cut represented about one and one-tenths tons of nut coal. It was found that it was impossible to keep the rooms cleaned up of the coal that was brought down fast enough to give the machines a chance to test their full capacity. Each machine is doing the work of from 12 to 14 pick miners.

SAVE YOUR MONEY BY USING
(HERCULES.) —THE— (PEERLESS.)

Isaac B. Potts Pipe Fittings.
Consisting of Ells, Tees and Crosses, and the connecting of Iron Pipe without cutting threads and Lead Pipe without solder. For sale by the ISAAC B. POTTS PIPE FITTINGS CO., 306 North High Street, Columbus, O.

A CAREFUL ENGINEER, AND A SENSIBLE STEAM USER

Patented Dec. 27, 1887. WILL ALWAYS USE THE BEST PACKING THAT THEY CAN BUY. Their attention is called to the special advantages of using ours.

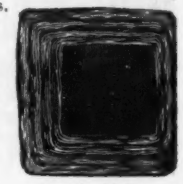


BEFORE USING.

Sensible Automatic Packing.

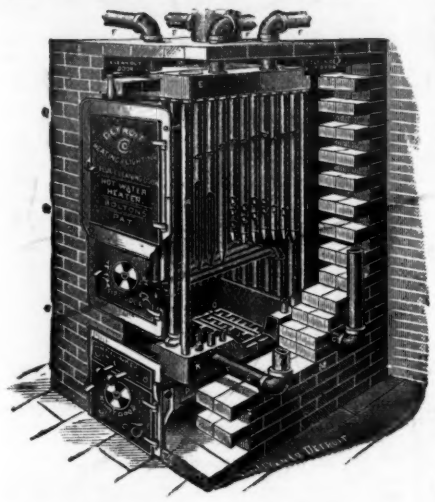
A combination of Pure Para Rubber for a core, that expands to twice its original size, always keeping the same size packing to the rod at all times. The Best Soft Long Fiber Flax, as a wearing surface that never becomes hard on any rod. And Japanese Wax for a lubricant, that Does Not Melt, and makes the packing impervious to Steam, Water, Ammonia, Oils or Acids. It does not belong to the numerous family of cheap packings. It is the "BEST" so is the "CHEAPEST." It is both a Steam and Hydraulic Packing, and will pack a Steam, Water, Oil, Air, Ammonia, Alkali Smooth, Fluted, Out-of-Round or Vibrating Rod, and last four times as long as any other. It is sold on its Merits, or on 30 days' trial. That always tells.

SENSIBLE AUTOMATIC PACKING CO., 63 South Canal St., Chicago, Ill.



AFTER USING.

BOLTON



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Most Economical, Durable and Easily Managed.

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Safe. Clean.

BEST RECORD IN CANADA AND THE BLIZZARD NORTHWEST.

And Radiators.

Its Vertical Circulation renders its action Prompt and Rapid.
Its Fire Surface is the largest in proportion to Grate Surface.
No Bolted, Flanged or Packed Joints; therefore cannot Leak.
Its Brick Casing entirely prevents loss of Heat in Cellar.
Wrought Iron; therefore cannot Crack.

WEBER STRAIGHTENING VALVES.

Send for Circulars.

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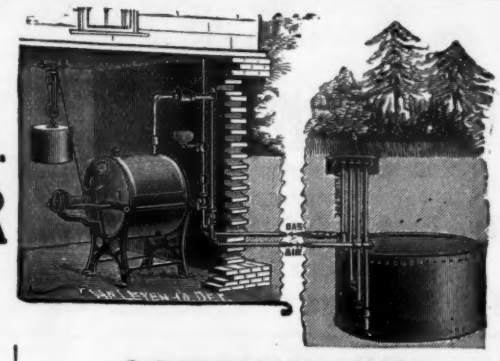

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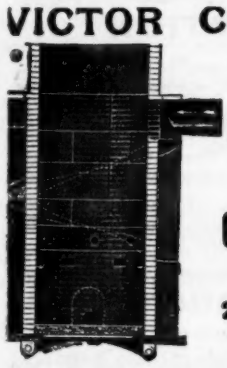

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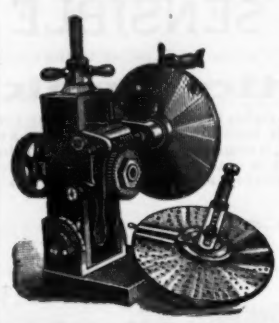

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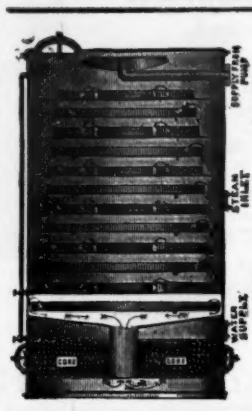

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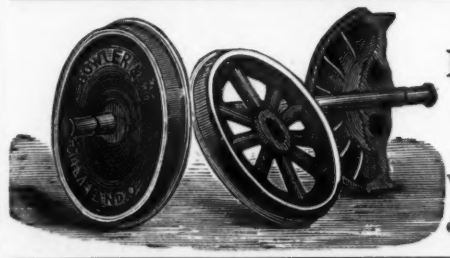

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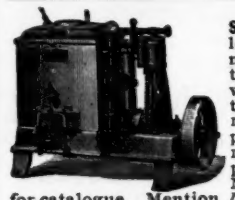

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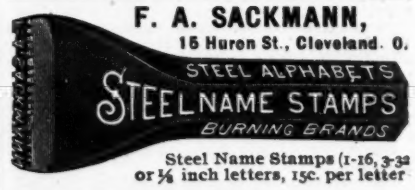

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2 to 2⅜ inch	2 15
2¼ to 3¼ inch	2 45
3⅜ to 4 inch	2 95
4⅛ to 4⅜ inch	3 45
4¾ to 5 inch	3 65

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⅜ to 1¼ inch	2 35
½ to ¾ inch	2 55
⅞	2 75
1	3 15

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1½ to 3 inch	3 05
⅜ to 1¼ inch	2 65
½ to ¾ inch	3 25
⅞	3 45
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1 to 1¾ by ¼ and 5-16 inch	2 25
½ to ⅞ by ¼ and 5-16 inch	2 45
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¾ and 11-16 by ⅛ to 3-16 in	3 15
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NORWAY IRON RIVETS.
SMOKE STACK AND GASOMETER RIVETS.
BAR IRON.
BAR STEEL.
STEEL AND IRON ANGLES.
SHEET IRON.
SHEET STEEL.
RAILROAD AND BOAT SPIKES.
WROUGHT IRON PIPE AND FITTINGS.
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AMERICAN FOUNDRY PRACTICE.
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West's Moulder's Text-Book
Being Part II of American Foundry Practice
Presenting best methods and original rules for obtaining good, sound, clean castings, and giving detailed description for making moulds requiring skill and experience.
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MACHINERY SUPPLY MARKET.

Anvils.

American.....₩ lb 9@10
Wrights.....₩ lb 9¼

Bellows.

Blacksmiths' { Hill's.....dis 40 / Bullock's.... dis 50&10
Moulders'.....dis 40@40&10
Hand.....dis 40&10@50

Belting.

Boston Belting Co's standard.....dis 70
" " " extra.....dis 60&5
" " " best.....dis 55
Hoyt's Short Lap.....dis 45
Cleveland Rubber Co. extra standard..dis 60&10
Shultz Raw Hide Leather Belting, single, ...dis 40
Shultz Raw Hide Leather Belting, double, and Light Double.....dis 40
Standard, oak tanned.....dis 50@60
Alexander Brothers' pure oak tanned. ...dis 45

Blowers and Exhausters.

B. F. Sturtevant's.....dis 30
Boston Blower Co.,.....dis 35
Buffalo.....dis 35

Borax.

.....₩ lb 9¼@10¼

Chalk.

White.....₩ gross 50
White Crayon.....₩ gross 12@12½ dis 10
Red.....dis 70
Blue.....dis 85

Chucks.

Cushman's 4 Jaw Independent.....dis 45
" Combination.....dis 40
" Geared Scroll.....dis 30
" 2 Jaw Brass Workers.....dis 30
" Drill.....dis 35
Wescott's Scroll Combination.....dis 33⅓
" Independent.....dis 40
" Little Giant Drill.....dis 30
Horton's Universal.....dis 40
" Independent.....dis 45
Whiton's Independent.....dis 45
National Combination.....dis 40
Sweetland " .....dis 40
Almond Drill.....dis 20
Morse " .....dis 15
Skinner's Combination Lathe.....dis 33⅓
" Independent Lathe.....dis 40
" Universal Lathe.....dis 40
" Drill.....dis 15

Cutters and Reamers.

Cleveland.....dis 10@15
Pratt & Whitney.....dis 10@15
Standard.....dis 10@15
Brown & Sharpe, Milling Cutters.....dis 15
" " Gear Cutters.....dis 15

Crowbars.

Cast Steel.....₩ lb 4
Iron, steel points.....₩ lb 3½

Drill and Drill Sockets.

Twist drills.....dis 50&10
Morse Taper and Straight shank to 1⅛".....dis 50&10
Morse Taper and Straight shank Larger than 1⅛".....dis 25
Drill Sockets.....dis 25
Standard Twist Drills.....dis 55@55&5
Cleveland " " .....dis 55@55&5

Emery.

	No. 4 to 46 gr.	No. 54 to 150. gr.	Flour, F.	C. F. FF.
Kegs, ₩ lb.	4 c	5 c		2½c
½ kegs ₩ lb.	4½c	5½c		2¾c
¼ kegs ₩ lb.	4¾c	5¾c		3 c
10 lb cans, 10 in case	6 c	6½c		5 c
10 lb cans, less than 10.	10 c	10 c		7½c

Emery Cloth and Paper.

Barder, Adamson & Co.....dis 45@50
H. H. Barton.....dis 50@5c&5

Emery Wheels.

Detroit.....dis 55@60
Norton's.....dis 55@60
Grant.....dis 55@60
Sterling.....dis 60
Celluloid.....dis 10&33⅓
Northampton.....dis 55
Crystal.....dis 65@70
Vitrified.....dis 60
Vulcanite.....dis 10&10

Files.

Nicholson.....dis 60&10@60&10&10
" X. F.....dis 25
Kearney & Foot.....dis 60&10@60&10&10
Black Diamond.....dis 60&10@60&10&10
Arcade.....dis 60&10@60&10&10
Disston's.....dis 65@70
Western.....dis 70
Stub's.....dis 25
Grobet's.....dis 30
Reynolds Bros.' Hand Cut.....dis 50
Industry File Works, hand cut.....dis 50

Hammers.

P. S. W.....dis 40
Atha new list, Jan. 15, 1887.....dis 50
Heavy hammers and sledges under 5 lbs. 18c over 5 lbs 14c, new list.

Jack Screws.

Illinois Bolt Co. list.....dis 70

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4½	4	3½	3¼
Hexagon	15¼	11⅛	8½	6	5½	5¼	5
Washers	9	8	7	5	4½	4¼	4¼

In lots less than 100 lbs, ₩ lb add ¾c., 1lb boxes add 1c to list.

Nails (wire.)

List July 14, 1887.....dis 70 &10
Standard Penny Nails, ₩ keg card rate { Car lots.....$2.30 / Less than car lots $2.40

Oilers.

Zinc and Tin.....dis 60
Brass and Copper.....dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₩ doz.....dis 10@10&10

Packing, Steam.

Boston Belting Co.....dis 60
American Packing Hemp.....₩ lb 10@11
Russia Packing " .....₩ lb 14
Italian Packing " .....₩ lb 13@14
Plumbago Piston.....₩ lb 40
Morrison's " .....₩ lb 50
Square Flax " .....₩ lb 50
Sheet Rubber.....₩ lb 12&24
Excelsior Rubber.....₩ lb 48

Picks.

Railroads, 5 to 6 lbs.....$12 dis 60
" 6 to 7 lbs.....$13 dis 60

Pulleys.

Iron Pulleys, Walker List.....dis 45
Medart Pulleys.....dis 55
Split Wood Pulleys.....dis 50@55

Rivets.

Iron, Thousand, list November 17, ...dis 50
Iron, Ordinary, Cooper's Block and Carriage list November 17.....dis 50
Copper.....dis 50@50&10

Rope.

Manilla, ½ inch and over.....₩ lb 13¼
Sisal, ½ inch and over.....₩ lb 13¼

Sand Paper.

B. A. & Co.....dis 45@50
H. H. Barton's.....dis 40@45
New England Flint.....dis 40@50
Barton's Garnet.....dis 20

Saws.

Disston's Circular.....dis 45
" Band.....dis 20
" Scroll.....Net
Hack Saw Stubs.....dis 20
" " Eureka.....dis 20
" " Star.....dis 20
Saw Swages Disston's.....dis 20
Atkins' Circular Saws.....dis 50
" Mill, Mulay and Drag Saws..dis 40&10
" Wood Saws.....dis 40&10
" Silver Steel Diamond Cross-cut Saws.....dis 70c per ft
" Dexter Cross-cuts.....dis 50c "
" Diamond " .....dis 30c "
" Tuttle Tooth Cross-cuts..dis 25c "
" One-man Cross-cuts.....dis 32c "
No. 1 Handles.....dis 23c per pair
No. 6 " .....dis 16c "
Excelsior Saw Tools.....$6 per doz
Perfection " .....$15 "
Detroit Saw Works, Circular.....dis 50
" " " Band.....dis 25
" " " Mulay.....dis 45

Screws.

Wood Screws—List Jan 27, 1889.

Flat head iron.....dis 50
Round head iron.....dis 40
Flat head brass.....dis 45
Round head brass.....dis 35
Square Cap.....dis 65
Hexagon Cap.....dis 60
Set C. H. C. P.....dis 70
Machine, flat head, iron.....dis 65
Machine, round head, iron.....dis 60
Bench and hand—
Lag or coach.....dis 75@75&10
Coach, patent gimlet point.....dis 75

Shovels and Spades.

Ames' list November 1, 1885.....dis 20
Dennis.....dis 5.25
Hussey & Binns, railroad.....dis 8.00

Taps.

Cards, Hand and Nut to 2 in.....dis 50
Carpenters' " " " .....dis 50
Morse " " " .....dis 50
Pratt & Whitney " " new list dis 10
Machine Screw Taps.....dis 55
Pipe Taps to 2½ in.....dis 70
Stay Bolt Taps.....dis 25
Stove Bolt Taps.....dis 50
Pulley Taps.....dis 40

Twine.

	BC.	B.
No. 12, Flax Twine, ¼ and ½ lb Balls		21c@29c
No. 18 " " ¼ and ½ "		18c@28c
No. 36 " " ¼ and ½ "		16c@27c
2-Ply Hemp, ¼ & ⅜ lb Balls (Spring Twine)		11½c
3-Ply " 1lb Balls		12@12½c
3-Ply " 1¼ lb Balls		11@11¼c
Cotton Wrapping, 5 Balls to lb		15@16c

Vises.

Solid Box.....dis 60
Parker's.....dis 20@25
Prentiss.....dis 20
Stephen's.....dis 25@30
Barrett's.....dis 30
Miller's Falls.....dis 40
Merrill's.....dis 10@15
Howard.....dis 30

Wire.

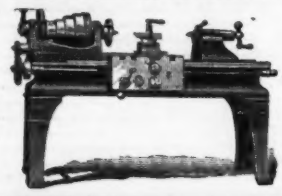
New List, Jan. 18, 1884

Brass and copper.....dis 20@25
Bright and annealed, Nos. 0@18...dis 70&10@75
" " Nos. 19@26..dis 75@75& 5
" " Nos. 27@36..dis 75&10& 5
Coppered Nos. 0 to 18, market list..dis 70@70& 5
Galvanized Nos. 0 to 18 " " .....dis 65&5
Tinned market Nos. 0 to 18.....dis 67½
Cast steel.....dis 50
Tinned Broom Wire.....dis 70&5@70&10
Annealed Fence, Nos. 8 and 9.....dis 75
Annealed Grape, Nos. 10 to 14.....dis 75
Stub's Steel Wire regular.....$6.00@lb dis 3

Wrenches.

Coe's genuine, ...dis 50
Girard Standard.....dis 70&10
Agricultural.....dis 75&10
Mechanics'.....dis 55&10,& 3
Bemis & Call's Combination .....dis 35
Donohue's Engineers.....dis 20&10
Lamson & Sessions Engineers.....dis 60
Billings & Spencer's Drop Forged.....dis 10
William's " " .....dis 10
Alligator " " .....dis 40

18-INCH ENGINE LATHES



With splined screw feed, with or without power cross feed and rod feed.

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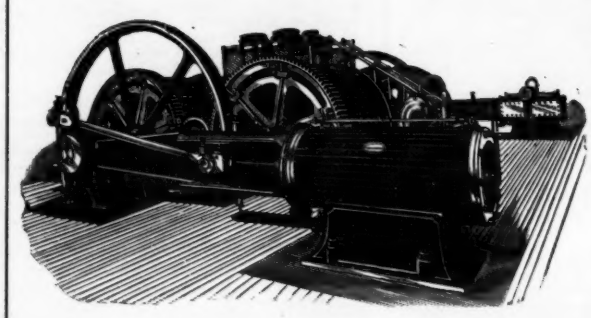

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Wire Rope Haulage Machinery,

Endless or Tail Rope Systems.)

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IRON CASTINGS.

DAILY MELTING CAPACITY 75 TONS-SPECIAL FACILITIES FOR ECONOMICALY TURNING OUT SMOOTH CLEAN CASTINGS.

DUPLICATE WORK A SPECIALTY

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SPLENDID LOCATION FOR LIGHT MANUFACTURING.

On or about December 1, 1890, we will remove our entire plant to the new Vincent building, on Vincent street, between Music Hall and the Hollenden, now occupied by the Dangler Stove & Manufacturing Co. We shall take the entire building, which has a frontage on Vincent street of 47 feet, a depth of 00 feet, and an aggregate floor space of 24,000 square feet. Of this space we will rent to the right parties about 5,000 square feet, with power. The building is located in the centre of the important business district on Euclid avenue and Superior street, and was especially designed and constructed for power purposes. It is lighted on three sides, is equipped with large freight elevator, is heated with steam, and has gas and water on all five floors. Terms reasonable. Apply to

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MADE IN ALL SIZES OF

Malleable Iron and Steel,

DESIGNED FOR

Elevators, Conveyors, Drive Belts, etc.

For handling materials of all kinds.

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HARDWARE MARKET.

Augers and Bits.

Common augers and bits.....dis 70
Snell's.....dis 60&5
Cook's Douglass Mfg. Co.....dis 55
Russell Jennings' augers and bits.....dis 25
Expansive Bits, Clark's small, $18; large, $26.....dis 35@35&5
Hollow Augers, Ives'.....dis 25&10
Hollow Augers, Bonney's Adjust. ℔ doz., $48.....dis 40&10
Hollow Augers, Stearns' Adjust. ℔ doz., $48.....dis 20&10
Gimlet bits, common.....per gross $3 25@4 00
Standard Bit Stock Drills.....dis 50&10&5
Ship Augers.....dis 15&10@15&10&5

Axes.

Makers' and Special Brands—
First quality.....℔ doz $8 00
Others.....℔ doz $7 00
Full polished.....℔ doz $9 00

Bolts.

Cast iron barrel bolts.....dis 70
Cast iron shutter bolts, etc.....dis 70
Cast iron chain bolts.....dis 65&10
Ives' patent door bolt.....dis 60
Wrought iron barrel bolts.....dis 70
Wrought iron square bolts.....dis 70
Wrought shutter bolts.....dis 60&10
Sargent's list
Carriage, common, new list.....dis 70&10&7
Tire, common, new list.....dis 70
Carriage and tire, Philadelphia pattern.....dis 75&10
Stove bolts.....dis 60
Plow bolts.....dis 60&5
Machine.....dis 75&10@80
Ends.....dis 75&10&80

Buckets, Elevator.

.....dis 50&10

Butts.

Wrought brass.....dis 75&10
Cast brass, loose joint.....dis 33⅓
Cast Iron—
Fast joint, narrow.....dis 50&10&5@60
Fast joint, broad.....dis 50&10@60
Loose joint.....dis 70&5
Loose joint, jap.....dis 70&5
Loose joint, jap. with acorns.....dis 70&5
Loose pin, acorns.....dis 70&5
Loose pin, japanned acorns.....dis 70&5
Loose pin, acorns, jap. plated tips.....dis 70&5
Wrought steel—
Wrought, fast joint, narrow.....dis 70&5
Wrought, fast joint, broad.....dis 70&5
Wrought, loose joint, broad.....dis 70&5
Table Butts, back flaps, etc.....dis 70&5
Regular inside blind.....dis 70&5
Light inside blind.....dis 70&5
Loose pin.....dis 70&5
Light loose pin.....dis 70&5

Carbonized Felt and Building Papers.

(POWERVILLE BRAND.)

Eberts Bros., Detroit.	Per roll of 500 sq. feet.
No. 1—Slaters'	$1.25
"A," Stringed Roofing, Light.	1.50
"B," Stringed Roofing, Medium	1.75
"C," Stringed Roofing, Heavy	2.00
Stringed, Rosin-Sized	1.00

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Asphaltum, Trinidad Refined, ℔ ton	$30.00
Asphaltum, Fine Grade, ℔ lb	.08
Coal Tar Felt, 1 Ply, ℔ lb	.c2
Coal Tar Felt, 2 Ply, ℔ roll 108 sq ft	1.42½
Coal Tar Felt, 3 Ply, ℔ roll 108 sq ft	1.85
Roofing Pitch, ℔ gal	.09

Chains.

Revised List.

Trace, 6¼-10-2.....℔ pair 1.03
Trace, 6¼-10-3.....℔ pair .92 } .....50&10
Trace, 7-10-2.....℔ pair 1.11
German Halter Chain, list June, 1887...dis 50&10
German Coil, list of June, 1887.....dis 50&10@60
Galvanized Pump Chain.....℔ 05¼@06
Jack Chain, Iron.....dis 75@75&5
Jack Chain, Brass.....dis 75

Chisels.

Socket Framing and Firmer.....dis 75
Socket Framing and Firmer, Buck Bros..dis 30
Socket Firmer and Framing, L. & I. J. White.....dis 30@30&5
Tanged Firmers.....dis 40&10

Cutlery.

Table.....net
Excelsior Pocket.....net

Fibre Ware—Standard.

	Nos. 1	5.	5X.
Pails, water, 12 qt	$4 00	$4 50	$.....
Dairy, 14 qt	4 50	5 00	.....
Fire 12 qt	5 00	.....	.....
Sugar	6 00	6 50	.....
Horse	.....	5 00	.....
Buggy	4 00	.....	.....
Chamber, Slop, Commode } 5 and 5X 14 qt.	6 50	7 50	8 50
Jars, slop, 5 and 5X 14 qt	8 00	9 00	10 00

	Nos. 1	5.	5X.
Basins, wash—			
10½ inch	2 00	2 25	.....
12 inch	2 25	2 75	3 25
13½ inch	2 75	3 25	3 75
15 inch	3 25	3 75	4 25
Bowls, fruit	.....	2 50	.....
Servers, 12 in	.....	2 25	.....
Baskets, waste paper, 13 in	.....	6 00	.....
Spittons, "Daisy," pressed			
8 inch	4 00	4 50	5 00
10 and 11½ inch	6 00	6 50	7 50

No. 1 plain; No. 5 decorated; No. 5X White decorated.

Gimlets.

Nail and Spike.....dis 50&10&5
Double cut, low list.....dis 25
"Bee".....℔ gross $12, dis 25@25&5

Hanger

Barn door, old patterns.....dis 60&10&10@70
Climax, (Anti-Friction).....dis 60
Scranton.....dis 40
Kidder's.....dis 50&10@60
Terry's Patent.....5 in., $12; 4 in., $10, dis 50&5
Paragon.....dis 50&10
Richard's.....dis 30@30&10

Horse Nails.

No.	10	9	8	7	6	
Ausable, ℔ lb.	23	24	25	26	28	dis 40
Putnam, ℔ lb.	18	19	20	21	23	dis 15

Essex.....dis 25&10

Horse Shoes.

Burden, at factory.....℔ keg $4 00
R. I. Horshoe Co., Perkins' Imp. at factory.....℔ keg $4 00
Mule Shoes, at factory.....℔ keg $5 00

Knobs.

Carriage, japanned.....℔ gross 80c dis 60&10
Base, rubber tip.....dis 70&10&5
Hematite door knobs, new list.....dis 40&10@50
Door mineral.....dis 65c@68c
Door Por. japanned.....dis 75c@78c
Door Por. nickle.....$2 00@2 25
Door Por. plated.....$2 00@2 25

Locks, Bolts, Etc.

P. & F. Corbin, Locks and Bronze Goods.
Door locks, knobs and latches.....dis 60
Escutcheons and keys.....dis 60
Padlocks and padlock keys.....dis 70&10
Bell pulls, mineral, porcelain and jet.....dis 60
Bell pulls, genuine bronze.....dis 60&10
Lever bell pulls, genuine bronze.....dis 60&10
Butts', genuine bronze.....dis 60&10
Butts' bronze plated.....dis 60&10
Store door locks and latches.....dis 60&10
Store door handles.....dis 60&10
Shutter hinges&flaps, genuine bronze.dis 60&10
Shutter hinges, bronze plated.....dis 70
Flush bolts, genuine bronze.....dis 70
Shutter knobs, genuine bronze.....dis 50
Shutter bars, genuine bronze.....dis 60
Sash lifts, genuine bronze.....dis 60
Sash pulls and plates, genuine bronze.....dis 60
Push plates, genuine bronze.....dis 60
Drawer pull, genuine bronze.....dis 70
Letter box plates, genuine bronze....dis 60&10
Barn door locks.....dis 33⅓
Bishop's Buckeye Sash Locks.....℔ gross $4.80

Plumbs and Leve s.

Standard list.....dis 70&10
Pocket levels.....dis 70&10
Davis' inclinometers.....dis 10&10

Pumps.

Cistern, best makers.....dis 50&10@60
Pitcher spout, best makers dis 60&10@60&10&10
Pitcher spout, cheaper goods.....dis 70@70&5

Pokes, Animal.

Bishop's I. X. L.....℔ doz $6 00
Bishop's O K.....℔ doz $5 25
Bishop's Pioneer.....℔ doz $3 75
Bishop's American.....℔ doz $2 75

Rakes.

Cast steel.....dis 70
Malleable.....dis 70@70&5

Razors.

J. R. Torrey Razor Co.....dis 20
Wostenholme & Butcher.....$10@[illegible]...dis 10
Rifle razor.....dis $9 50 net

Rat Killers.

Schuyler's.....℔ gross $15 00

Scales.

Hatch, Counter, No. 171.....℔ doz $21 00
Hatch, Tea, No. 161.....℔ doz $6 75@7 00
Chatillon's Grocers.....dis 50
Family Turnbulls.....dis 30@30&10
Scale Beams, List of January 12, 1882.....dis 50&10@50&10&4

Screw Drivers.

Stanley R. & L. Co.'s Varnished Handles.....dis 65&10
Stanley R. & L. Co.'s Black Handles..dis 60&10
Sets interchangeables.....℔ doz $18 dis 25

Squares.

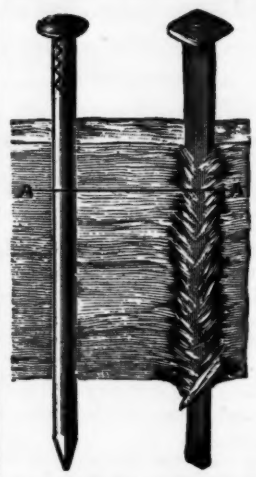
Steel and iron, Nickel plated } dis 75&10@80
Disston's try square and T bevels.....dis 45&10
Winterbottom's try and miter.....dis 30&10

Tacks, Brads, Etc.

New List, Oct. 19, 1890.

Amerios iron carpet tacks all kinds dis 70&10&10
[illegible] carpet tacks all kinds.....dis 70&10&10
[illegible]edes iron carpet tacks, all kinds dis 70&10&10
Swedes iron tacks.....dis 70&10&10
Swedes iron Upholsterers' tacks..dis 70&10&10
Tinned Swedes iron tacks.....dis 70&10@10
Tinned Swedes iron Upholsterers' tacks.....dis 70&10&10

American iron cut tacks	dis 67½&10&10
Copper tacks	dis 50
Copper finishing and trunk nails	dis 50&00
Cigar box nails	dis 45&10
Finishing nails	dis 6
Hungarian nails and miners' tacks	dis 62½&5
Gimp and lace tacks	dis 70&5
" " " tinned	dis 66&10
Trunk and clout nails	dis 66⅔
Tinned trunk&clout nails	dis 66&10&10
Basket nails	dis 66&10&10
Chair nails	dis 66&10&10
Common and patent brads	dis 66&10&10



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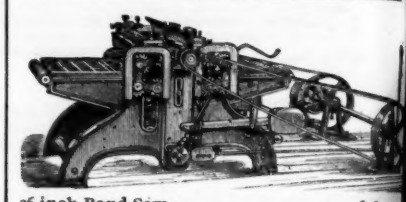

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Bedford—6:50 a. m., 11:10 a. m., 1:30 p. m., 3:00 p. m., 4:40 p. m., *5:45 p. m., 6:20 p. m. 10:35 p. m.
Newburgh—6:15 a. m., 6:50 a. m., 11:10 a. m., 1.30 p. m., 3:00 p. m., 4:40 p. m., *5:45 p. m., 6:20 p. m., 10:35 p. m.

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Zanesville and Coshocton—10:30 a. m., 6:30 p. m.
Canton, 10:30 a. m., 2:35 p. m., 6:30 p. m.
Kent—*8:10 a. m., 10:30 a. m., 2:35 p. m., 6:30 p.m.
Bedford—6:00 a. m., *8:10 a.m., 10:30 a.m., 1:05 p. m., 2:35 p. m., 4:15 p. m., 6:30 p.m., 7:10 p.m.
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	*11 10 p m	.....
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No. 71, Youngstown Accom.....	* 7 15 a m
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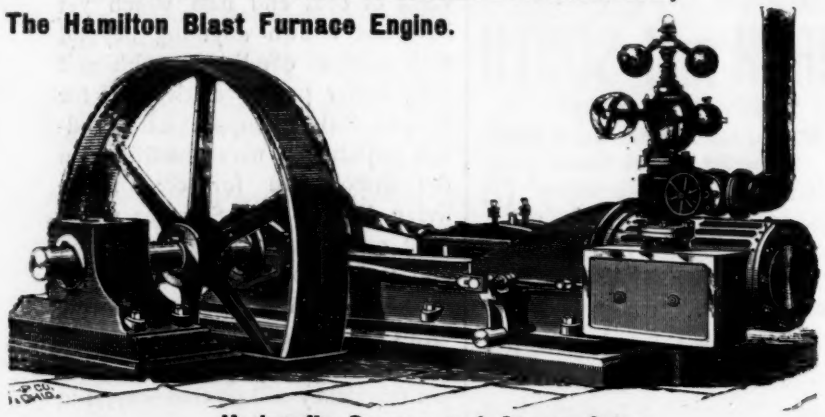

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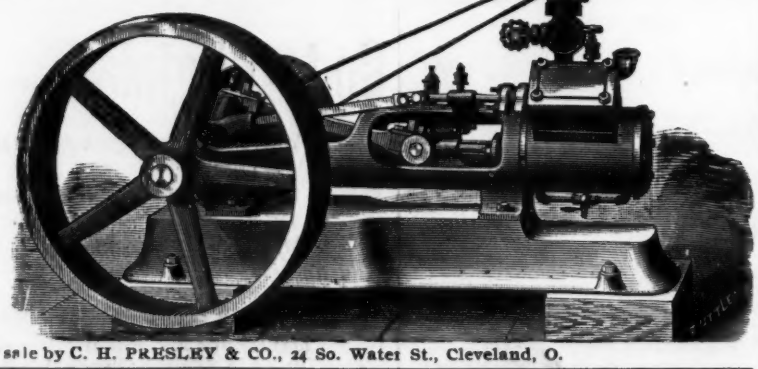

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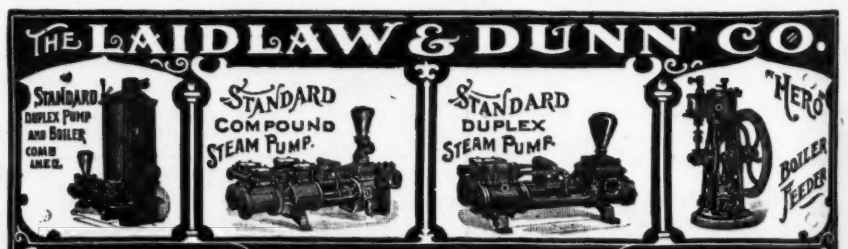

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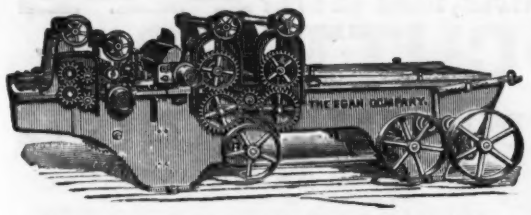

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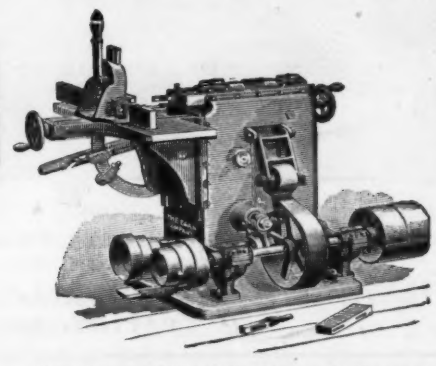

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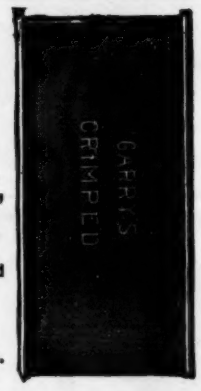

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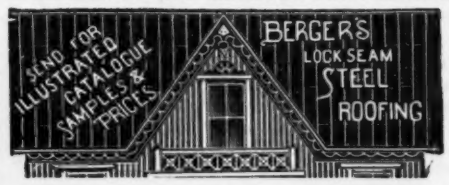

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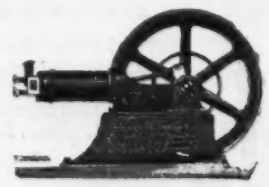

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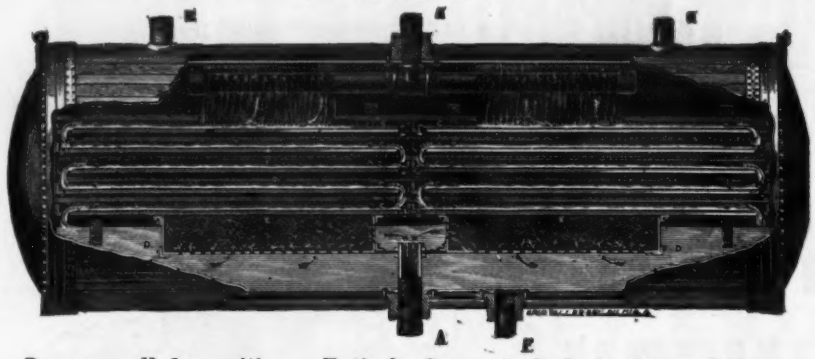

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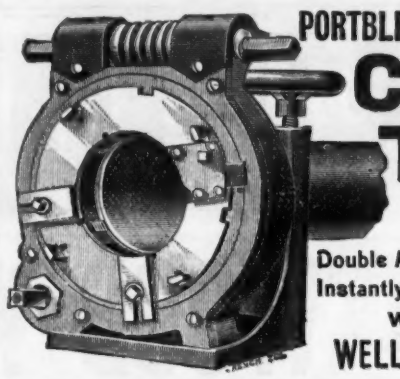

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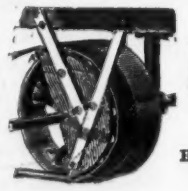

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